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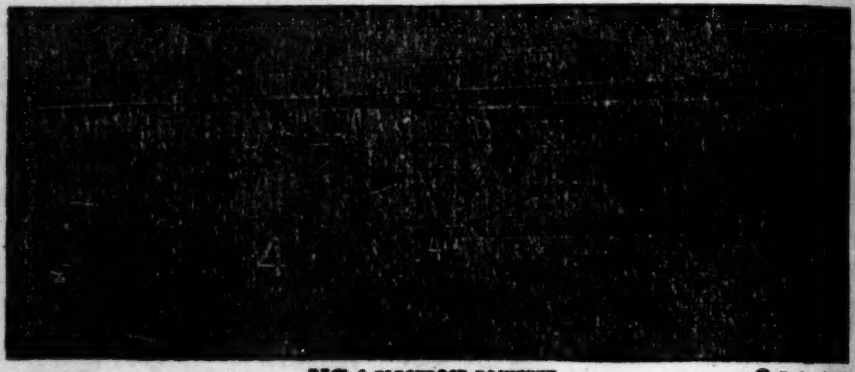
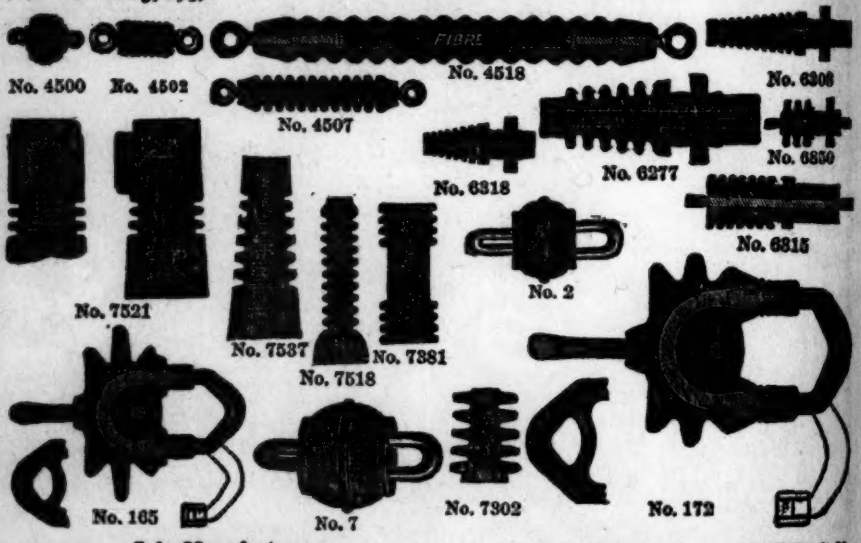


NC-4 ELECTROSE EQUIPPED © E. L., N. Y.

"By courier, coach and sail-boat, it took days for the news of Waterloo to reach London. During Lieut. Commander Read's flight to Halifax, Assistant Secretary Roosevelt in Washington sent a radio message to NC-4, of whose position in air he had no knowledge. In three minutes he had a reply."—*Extract from New York World, June 3, 1919.*



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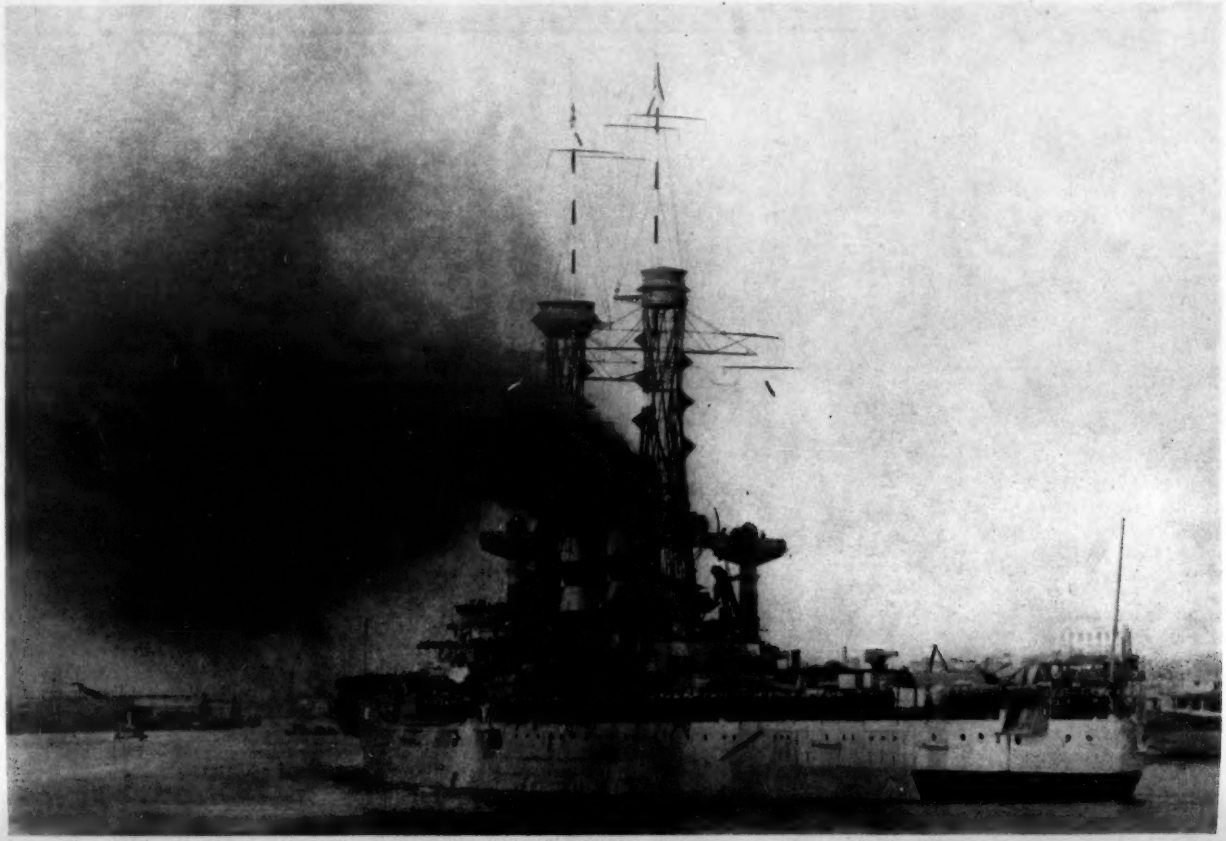

THE FLORIDA LEAVING THE NORFOLK NAVY YARD TO JOIN THE GRAND FLEET.

UNITED STATES NAVAL INSTITUTE PROCEEDINGS

Vol. 46, No. 5 **MAY, 1920** **Whole No. 207**

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

POSSIBILITIES OF A TRANS-PACIFIC FLIGHT

By COMMANDER G. C. WESTERVELT (C. C.), U. S. Navy,

AND

H. B. SANFORD, Aeronautical Engineer, Naval Aircraft Factory

At 9 o'clock in the evening of May 27, 1919, the *NC-4*, the giant flying boat of the United States Navy, landed at Lisbon, Portugal, completing the last lap of the trans-Atlantic flight from Newfoundland to Portugal. Interested watchers had crowded the hills overlooking the harbor ever since news of the start from the Azores had been received, although they knew very well that they would have many hours to wait before the ship could reach Lisbon. Their patience was finally rewarded by the appearance of the *NC-4*, which glided down to the water and was quickly moored to the mother ship. This last lap of the flight had been accomplished without difficulty, and had proved conclusively that a trans-Atlantic flight was within the range of human possibilities.

In thus completing the first transoceanic flight, the *NC-4* had been successful where various competitors had failed. The *NC-1* and the *NC-3*, which left Newfoundland with the *NC-4*, had been forced down, when near the Azores, by adverse weather conditions, and had been unable to continue the flight. After the crew had been taken off the *NC-1*, an attempt was made to tow the craft to Horta, but the tow-line broke, and the machine finally sank.

THE FLORIDA LEAVING THE NORFOLK NAVY YARD TO JOIN THE GRAND FLEET.

The *NC-3*, after being adrift for 60 hours in a severe storm, made Ponta Delgado under her own power, but was too badly damaged to proceed further on the flight.

On May 18, 1919, while the fate of the *NC-3* was still in doubt, Hawker and Grieve made their unsuccessful attempt to fly a Sopwith biplane from Newfoundland to Ireland, and were forced down by engine trouble when only 1200 miles out. Fortunately, they were picked up by a tramp steamer, but the plane was a complete wreck.

The *C-5*, a United States Navy airship of the non-rigid type, had been specially equipped for a trans-Atlantic flight, to compete with the *NC* flying boats. After flying from Montauk Point, L. I.,

THE U. S. NAVY FLYING BOAT "NC-4," ON HANDLING TRUCK AT ROCKAWAY BEACH NAVAL AIR STATION.

The *NC-4* has a cruising radius of approximately 1400 nautical miles, and holds the non-stop flight record for seaplanes, made in the trans-Atlantic flight.

to St. John's, Newfoundland, the *C-5* broke away from its moorings during a severe storm, was blown to sea and wrecked.

The record of the *NC-4* was not long to stand alone. On June 14 and 15, 1919, Messrs. Alcock and Brown, in a two-motored Vickers-Vimy bombing plane, made a non-stop flight from Newfoundland to Ireland, breaking all non-stop records for heavier-than-air machines, and accomplishing the first non-stop trans-oceanic flight.

The next flight across the Atlantic was made by the *R-34*, a British airship of the rigid type, which arrived at Mineola, L. I., on July 5, 1919, after a flight of 108 hours duration from East Fortune, Scotland. Stiff head winds were encountered throughout the course, which accounted for the more than four days required

for the trip. After a few days at Mineola for refueling and inspection, the return flight was made. Weather conditions were more favorable, and the time required for the return trip was only 75 hours. The record of the *R-34* in making a round trip air voyage across the Atlantic still stands alone.

After the completion of the trans-Atlantic flights described above, attention was naturally turned to a consideration of flights across the Pacific. It was well known that such a flight would involve difficulties not met in the trans-Atlantic flight, but the extent of these difficulties was not known.

The following study of the possibilities of a trans-Pacific flight has been made in the attempt to collect all the available information regarding the conditions upon which such a flight would depend. These flight conditions may be grouped under the following heads:

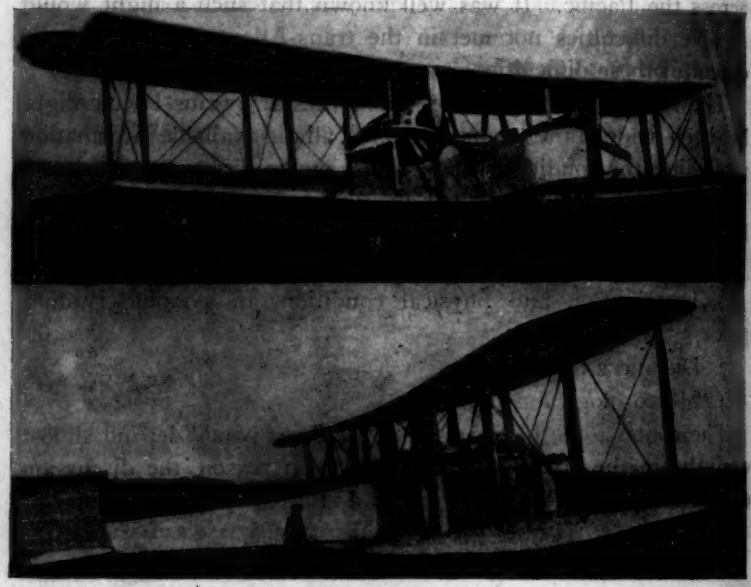
1. Types of machines available.
2. Distribution and physical conditions of possible landing places.
3. Distances to be flown.
4. Meteorological conditions.

The routes to be followed in such a flight would depend almost entirely on the above conditions; for that reason, the discussion of possible routes will be based on a study of these conditions.

1. TYPES OF MACHINES AVAILABLE

Four types of machines could be considered as available for such a flight. They are airplanes (land machines), seaplanes of the flying-boat type, non-rigid airships and rigid airships. The two types first named are heavier-than-air machines and the airships are lighter-than-air craft. The non-stop flight record for all types of aircraft is held by the rigid airship. It is reported that during the war a German rigid, the *L-53*, which was dispatched from Bulgaria to carry ammunition and medical supplies for the relief of the troops in German East Africa, was recalled by wireless after reaching Khartoum, in southern Egypt. The total distance flown, in the neighborhood of 4000 nautical miles, was covered in 100 hours, and it is reported that sufficient fuel remained on board for an additional 60-hour flight.

The heavier-than-air non-stop record, as noted previously, is held by the Vickers-Vimy bomber, flown by Alcock and Brown in the flight from Newfoundland to Ireland, a distance of 1680 nautical miles. The seaplane record is held by the *NC-4*, made in the flight from Newfoundland to the Azores, a distance of approximately 1200 nautical miles. An *F-5-L* flying boat, tested at Hampton Roads, flew for over 20 hours at an average airspeed



THE VICKERS-VIMY BIPLANE, FIRST TO CROSS THE ATLANTIC IN NON-STOP FLIGHT.
This machine holds the heavier-than-air non-stop flight record.

of 55 knots, covering in that time something over 1100 nautical miles.

The non-rigid airship record is probably held by the *C-5*, which in its flight from Montauk Point to St. John's, referred to previously, covered a distance of approximately 1200 nautical miles. This flight was accomplished in 25 hours and 50 minutes. The endurance, as calculated just before getaway at Montauk Point, was 47 hours at a cruising speed of 40 knots, or 1880 nautical miles.

From the records given above, with a choice based on radius of action and reliability, the machines would be classed, in the

order of their merit: (1) Rigid airship; (2) non-rigid airship; (3) flying boat. The experience of Hawker and Grieve in their attempted trans-Atlantic flight indicates that a land machine is not safe for long distance flights over water. If a seaplane of the *NC* or *F-5-L* type were used, it probably would be found necessary to refuel at sea from a destroyer, unless it were found possible to follow the coast around the North Pacific from the United States to Japan and China.

BRITISH RIGID AIRSHIP "R-34," WHICH FLEW FROM EAST FORTUNE, SCOTLAND, TO MINEOLA, L. I., AND RETURNED TO EAST FORTUNE. THE ROUND TRIP WAS MADE IN 183 FLYING HOURS.

2. DISTRIBUTION AND PHYSICAL CONDITIONS OF POSSIBLE LANDING PLACES

It is possible to find at any of the American cities along the Pacific coast suitable landing places for both land machines and seaplanes of the heavier-than-air type, and for all types of lighter-than-air machines. The cities which most likely would be chosen as starting points for such a flight would be San Francisco and Seattle; these cities are well provided with suitable landing fields and harbors.

At Honolulu there are good facilities for landing all types of machines. The large harbor provides a landing for all types of

seaplanes, and the parade ground at Fort Schofield provides excellent landing facilities for land machines and lighter-than-air craft.

Landing fields between Honolulu and the Asiatic coast are not numerous, nor of the best for any type of machine. Possible harbors for seaplanes could be found at Jaluit, in the Marshall Islands; at Ponape or at Truk, in the Carolines; at Guam; at Yap; at Cebu and at Manila, in the Philippines; and at Hongkong or at Canton, along the south China coast.

In following the North Pacific coast from Seattle, landings could be made by seaplanes at Sitka, at Kodiak and at Unalaska, in Alaska; at Petropavlovsk, on the Kamchatka peninsular; at Nemuro, Yokohama and Nagasaki, in Japan; and at Shanghai, on the China coast.

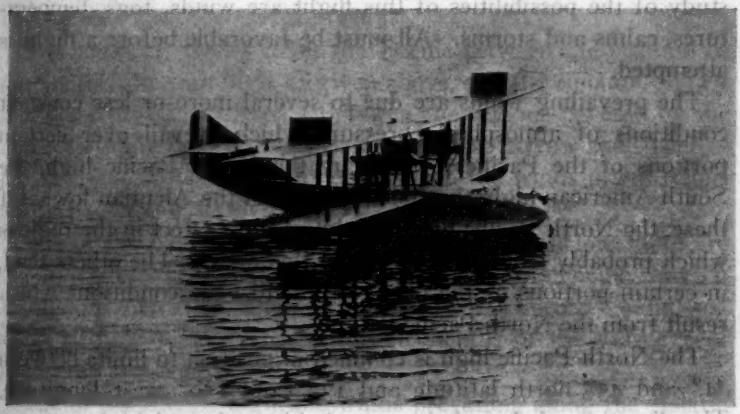
Very few, if any, of the places enumerated in the two preceding paragraphs would provide suitable landing fields for land machines. The small islands of the Pacific are in general only coral reefs, and would, in all probability, be rough and unsuitable for landing purposes. Those of the islands which are of volcanic formation are simply high, rocky projections which would be entirely unsuited for landings. At a few points it is probable that landings could be made, particularly at Guam and at Manila, where there are parade grounds maintained by the United States forces stationed there. On some of the islands, it would be possible to erect mooring towers for lighter-than-air craft, but the work involved would be very great. Along the North Pacific coast the greater part of the land is such that it would be difficult to find a field large enough and sufficiently smooth for the landing of a land type machine.

3. DISTANCES TO BE FLOWN

The shortest distance in a direct line from any point on the west coast of the United States, exclusive of Alaska, to the nearest point of any commercial importance on the Asiatic coast is the distance from Astoria, Oregon, to Yokohama, Japan, a distance of approximately 4200 nautical miles. The *minimum* distance at any point between the American continent and the Asiatic continent is between the northwest extremity of Alaska and the most northeasterly point of Siberia, a distance of approximately 25

miles. Because of location and of weather conditions, a flight across this short space would hardly be considered.

For comparison with distances across the Pacific, the distance covered by Alcock and Brown in their trans-Atlantic flight was 1680 nautical miles, the record for any type of heavier-than-air machine; the distance flown by the *NC-4* from Newfoundland to the Azores was 1200 nautical miles, the record for seaplanes. It should be noted however, that the range of action of the *NC-4* as equipped for this flight was approximately 1400 nautical miles. The distance from San Francisco to Honolulu, which is the nearest landing point to the Pacific coast, is 2090 nautical miles, an increase



THE U. S. NAVY "F-5-L" FLYING BOAT.

One of these boats flew on a non-stop flight of over 20 hours, and covered slightly more than 1100 nautical miles.

of 410 miles over the greatest distance covered thus far by a heavier-than-air machine in a non-stop flight. The distance from Honolulu to the Asiatic coast at Hongkong is 4900 nautical miles, and from Honolulu to Yokohama, is approximately 3400 miles. The distance from Sitka across the North Pacific to the Alaskan Peninsula is approximately 1000 nautical miles, and from the Alaskan Peninsula across Bering Sea to Kamchatka, approximately 1260 miles.

These figures show that the proposed flight across the Pacific will involve non-stop runs which greatly exceed any which thus far have been accomplished in any type of heavier-than-air machine, unless the northern route is followed. The total distance

from Mineola to East Fortune, Scotland, flown by the *R-34*, was approximately 2700 nautical miles. This exceeds by 30 per cent the distance from San Francisco to Honolulu. The flight from Honolulu to Hongkong of 4900 miles could be broken up into three shorter flights, landings being made at Jaluit and at Guam, and, if desirable, at Manila. The flight of the German Zeppelin referred to previously would indicate that this type of machine could cover any non-stop run necessary in the trans-Pacific flight.

4. METEOROLOGICAL CONDITIONS

The meteorological conditions which must be considered in a study of the possibilities of this flight are winds, fogs, temperatures, calms and storms. All must be favorable before a flight is attempted.

The prevailing winds are due to several more or less constant conditions of atmospheric pressure which prevail over certain portions of the Pacific. These are the North Pacific high, the South American high, the Asiatic high and the Aleutian low. Of these, the North Pacific high has the greatest effect in the regions which probably would be covered in this flight. The others tend, in certain portions of the ocean, to modify the conditions which result from the North Pacific high.

The North Pacific high is confined in position to limits between 31° and 45° north latitude and 135° and 150° west longitude. The direction of the winds around this region of high pressure is anti-cyclonic, or clockwise.

The South American high is practically fixed in position at latitude 30° south and longitude 100° west (approximate). The direction of the winds around this region is cyclonic, or counter-clockwise.

The Asiatic high prevails off the Asiatic coast from October to April. It extends along the coast from Shanghai to north Korea, and eastward as far as 155° east longitude. It disappears in the spring and reappears in October. The direction of the winds around this region is anti-cyclonic, or clockwise.

The Aleutian low centers over Bering Sea, the Gulf of Alaska and the Alaskan Peninsula, and prevails from September to June. The direction of the winds around this region is cyclonic, or counter-clockwise.

Due to these conditions of atmospheric pressure, certain prevailing winds are found. These are the northeast trades, the southeast trades, the westerly winds, and the summer and winter monsoons.

The northeast trades are practically continuous throughout the year and extend from a few miles off the coast of the United States almost to the Philippine Islands. Their limits move north and south, between the equator and the 36th parallel, north latitude, following the change in position of the North Pacific high. In winter and spring they merge with the winter monsoons along the south Asiatic coast. For a distance of approximately 200 miles off the American coast, the winds may be variable, but beyond that limit the trades prevail.

The southeast trades cover the Pacific between the position of the South American high, as given above, and the equator. Their limits are practically fixed. Between the regions covered by the northeast trades and the southeast trades is a narrow zone, centering at about 10° north latitude, in which the winds are variable, northeast, east or southeast.

Due to the North Pacific high and the Aleutian low there are strong westerly winds covering that portion of the Pacific between Japan and Canada. These winds center between 45° and 50° north latitude, and prevail during all months of the year except June, July and August.

Due to the Asiatic high, the winds prevailing along the Asiatic coast during the winter months, known as the winter monsoons, are from the northeast. These winds often blow with storm force, and, in general, cause thick, rainy weather, and make navigation along the coast difficult. During May, June, July and August, the winter monsoons disappear and the summer monsoons take their place. These winds are in general from the southeast, and are not as strong or as constant as the winter monsoons.

The south Asiatic coast and the Philippine Islands are subject to frequent and severe typhoons—sudden tropical storms of great violence, originating in the Pacific Islands near the equator, and travelling west, northwest and northeast across the Philippines and the China coast. The number and severity of these storms is a maximum during the months of July, August and September, when there may be four to six per month, and a minimum during

February, during which month less than five have been reported during the last 22 years.

During the months from December to July inclusive, there may be severe storms originating along the Asiatic coast and moving in a generally northeasterly direction to the Aleutian Islands, the Alaskan and Canadian coasts. These storms may be of from six to eight days duration.

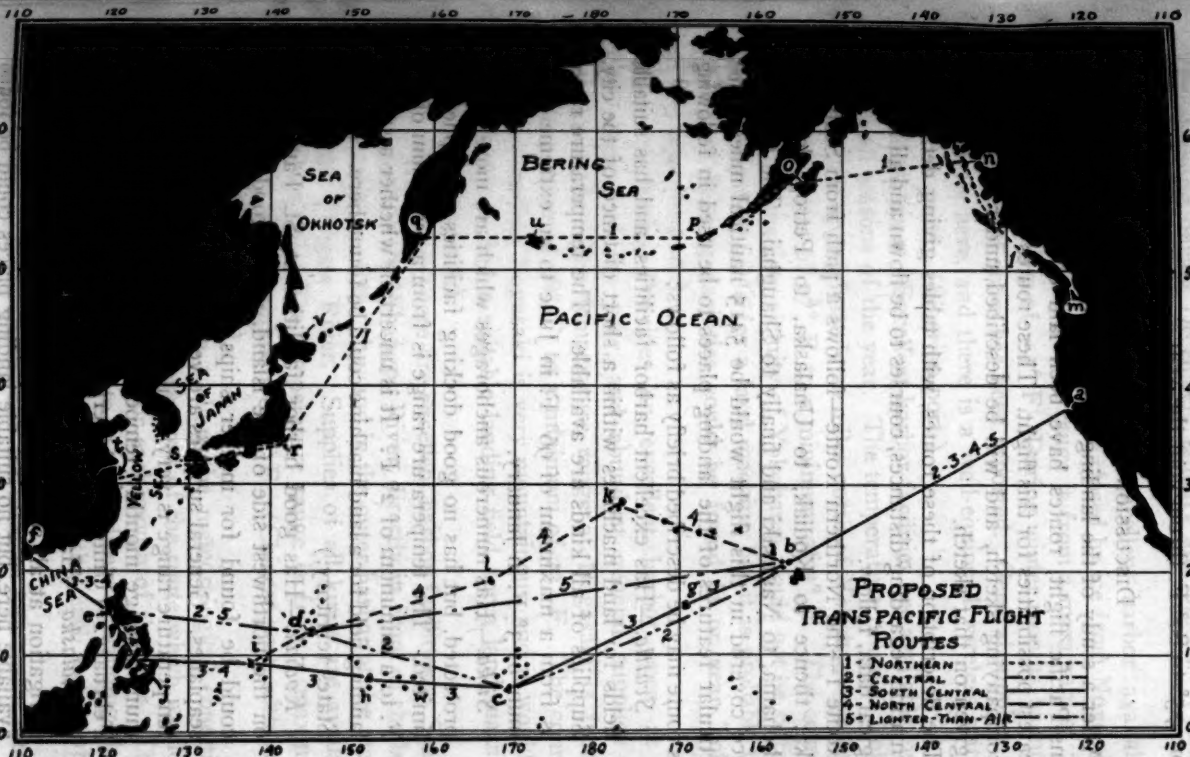
The Central Pacific is practically free from severe storms travelling along extended tracks, but is subject to severe local storms which may occur during almost any month of the year.

The effects of these winds and storms on flight along the different routes to be considered will be shown in the tables of meteorological conditions for each route.

A study of fog conditions shows that throughout the year fogs prevail along the west coast of America from San Francisco to Seattle and Sitka, the number of days of fog during the month varying from 5 to 40 per cent, depending on the season of the year. From Sitka to the Alaskan Peninsula and the Aleutian Islands, fog prevails during all months of the year except October, November and December. Across the North Pacific from the Aleutian Islands to Kamchatka, and south to Japan, fogs prevail during the months of June, July, August and September; from 30 to 50 per cent of the days of these months are with fog.

The most southerly mid-ocean limit of the region of fog is the Midway Islands, 28° north latitude, where during the month of May 15 per cent of the days are with fog. The portions of the ocean between the 28th parallel, north latitude, and the equator are free from fog throughout the year, except along the American coast.

The temperatures which prevail over the Pacific Ocean are such that they would cause no difficulties to aerial travel, except in the extreme north, in the neighborhood of Alaska and Kamchatka. The southerly limits of the average monthly temperatures which are below freezing are found during the months of December and January along a line extending through north Korea, north Japan, south Kamchatka, the Alaskan Peninsula and Sitka. During the month of July the average temperature along the line extending across north Kamchatka and the Bering Sea is 45° F. That portion of the ocean from Honolulu to the Marshall Islands, and west



(a) San Francisco.
(b) Honolulu.
(c) Jaluit.
(d) Guam.
(e) Manila.
(f) Hongkong.
(g) Johnston Island.
(h) Truk or Hogulo.
(i) Yap.
(j) Cebu.
(k) Midway Islands.
(l) Wake Islands.
(m) Seattle.
(n) Sitka.
(o) Kodiak.
(p) Unalaska.
(q) Petropavlovsk.
(r) Yokohama.
(s) Nagasaki.
(t) Shanghai.
(u) Attu Islands.
(v) Nemuro.
(w) Ponape.

to the Philippine Islands, has an average monthly temperature of from 75° to 80° F. throughout the year.

DISCUSSION OF POSSIBLE ROUTES

After a study of the landing places which could be used in the trans-Pacific flight, routes have been laid out which show the greatest possibilities for this flight. These routes are shown on the accompanying sketch, and will be described under the headings as given on that sketch.

The description of these routes, with tables giving detailed information regarding distances, courses to be flown and all meteorological data, follow.

Route 1—the Northern Route—follows a path from Seattle to Sitka, thence to Kodiak, to Unalaska, to Petropavlovsk, to Yokohama, to Nagasaki and finally to Shanghai. The total distance covered in this flight would be 5415 nautical miles. The particular features of the landing places to be used in following this route may be described briefly as follows:

Seattle.—Has excellent harbor facilities, and has suitable fields for land machines within a short distance of the city. Supplies of all kinds are available. The temperature range is from a maximum of 96° F. in June to an extreme minimum of 3° F. in January.

Sitka.—Has numerous anchorages which are more or less protected, but has no good docking facilities. Supplies are limited. The temperature range is from a maximum of 87° F. to a minimum of 2° F. It is uncertain whether a suitable landing field for a land machine could be found here. (United States territory.)

Kodiak.—Has good harbor facilities at St. Paul harbor on the northwest side of the island, where good anchorage could be found for mother ships to provide supplies for seaplanes. General supplies are very limited at Kodiak. The temperature range is very similar to that of Sitka, the minimum average monthly temperature of 28° F. obtaining in February. (United States territory.)

Unalaska.—Has several good anchorages and is open to navigation at all seasons of the year. General supplies are available here, but no suitable landing places could be found for land machines. The average monthly temperatures are

very similar to those of Kodiak, the minimum of 30° F. obtaining during December, January and March. (United States territory.)

Petropavlovsk.—There is an excellent harbor available, but unfortunately the harbor is closed by ice from November to May. The temperature range is from a maximum of 74° F. to a minimum of −7° F. During winter months, as much as 20 feet of snow has been reported. General supplies are available here, and there is a well-equipped wireless station at this point. (Siberian port.)

Yokohama.—Excellent harbor facilities are available, open at all seasons of the year. The temperature range at Tokio, which is approximately 20 miles north of Yokohama, is from a maximum of 97° F. to a minimum of 4° F. The country in the immediate vicinity of Yokohama would not be suitable for landing fields for a land machine, but it is probable that good landing facilities could be found in or near Tokio. (Japanese port.)

Nagasaki.—Provides an excellent harbor open at all seasons of the year, and abundant general supplies are available. The temperature range at Nagasaki is from a maximum of 98° F. to a minimum of 23° F. The country surrounding Nagasaki is very mountainous, and it would be difficult to find a suitable landing field for a land machine. (Japanese port.)

Shanghai.—There are excellent harbor facilities at Shanghai both on the Whangpo River, directly in front of the business section of the city, and in the outer harbor at the mouth of the Yangtse River. Supplies of all kinds are available at Shanghai. The temperature range is from a maximum of 105° F. to a minimum of 9° F. (Chinese port, with international settlement.)

The tables[1] for Route 1 show the meteorological conditions which obtain in each of the sections of the route which would be covered in a non-stop flight, for each month of the year. These tables also show the distances to be covered between landing places. A study of the distances to be flown shows that each section of the

[1] All tables of meteorological data are based on information obtained from monthly Pilot Charts of the North Pacific Ocean.

ROUTE 1

(Total Distance 5415 Nautical Miles)

Route	January Condition A	B	C	D	E	F	February Condition A	B	C	D	E	F	Distance, nautical miles	True bearing
Seattle to Sitka.	E.-SE.	15.6	15-20	37	6	7	S.-SE.	20	20	40	5	7	705	320°
Sitka to Kodiak.	E.	15.6	15	30	17	4	SE.	20	20	30	8	8	600	275°
Kodiak to Unalaska.	N.	29.5	15	32	12	7	N.	29.5	10-20	30	10	7	540	244°
Unalaska to Petropavlovsk.	Variable.	24.3	15	28	12	5	W.-NW.	29.5	0	25	15	4	1260	267°
Petropavlovsk to Yokohama.	NW.	24.3	0	40	13	6	NW.	24.3	0	35	12	7	1380	217°
Yokohama to Nagasaki.	NW.	24.3	0	55	6	9	NW.	20	0	47	7	7	510	252°
Nagasaki to Shanghai.	N.-NW.	24.3	0	50	2	9	N.-NW.	20	0	50	5	8	420	259°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 1

Route	March Condition A	B	C	D	E	F	April Condition A	B	C	D	E	F	Distance, nautical miles	True bearing
Seattle to Sitka.	Variable.	20	10-15	45	5	9	Variable, SE.	20	5-10	42	4	18	705	320°
Sitka to Kodiak.	Variable.	20	10	37	11	9	Variable, E.-W.	20	5	37	7	15	600	275
Kodiak to Unalaska.	NW.	20	10-15	37	11	6	Variable.	24.3	5	35	8	7	540	244°
Unalaska to Petropavlovsk.	Variable.	24.3	0	35	16	6	Variable. S.-NW.	24.3	0	33	9	6	1260	267°
Petropavlovsk to Yokohama.	NW.	24.3	0	47	15	8	Variable.	20	0	45	9	7	1380	217°
Yokohama to Nagasaki.	NW.	20	0	65	11	12	Variable.	20	0	60	4	12	510	252°
Nagasaki to Shanghai.	NE.-NW.	20	0	65	2	10	Variable.	20	0	60	2	12	420	259°

A—Direction prevaling winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 1

Route	May						June						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
Seattle to Sitka.	Variable, SE.-NW.	20	15	47	1	16	W.-NW.	20	20-30	50	2	17	705	320°
Sitka to Kodiak.	NE.-SE.	20	15	44	3	21	Variable, NE.-SW.	20	0	50	3	22	600	275°
Kodiak to Unalaska.	Variable.	20	15	40	5	16	Variable.	20	20-30	45	3	19	540	244°
Unalaska to Petropavlovsk.	Variable.	20	0	37	7	10	Variable.	20	40-50	42	2	13	1260	267°
Petropavlovsk to Yokohama.	Variable.	20	0	50	4	11	Variable, E.-SW.	20	20-50	55	2	12	1380	217°
Yokohama to Nagasaki.	Variable.	20	0	65	2	15	Variable.	20	0	75	2	22	510	252°
Nagasaki to Shanghai.	Variable.	15.6	0	70	1	15	E.-SE.	20	10	75	1	20	420	259°

A—Direction prevaling winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 1

Route	July						August						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
Seattle to Sitka.	Variable, NE.-SW.	20	25	55	2	16	NW.	20	15-30	57	3	20	705	320°
Sitka to Kodiak.	Variable, SE.-SW.	20	25	52	2	19	Variable, SW.	20	15	52	3	18	600	275
Kodiak to Unalaska.	Variable,	20	25-35	50	1	19	Variable.	20	20-30	52	2	21	540	244°
Unalaska to Petropavlovsk.	Variable, SE.-W.	20	35	45	2	13	Variable, SW.	20	30-40	52	3	11	1260	267°
Petropavlovsk to Yokohama.	Variable, E.-S.	15.6	25 50	60	1	16	Variable.	20	20-40	70	1	16	1380	217°
Yokohama to Nagasaki.	SW.	20	0	78	2	21	Variable, NE.-SW.	20	0	80	3	18	510	252°
Nagasaki to Shanghai.	SE.-SW.	20	15	78	1	17	Variable. SE.-SW.	15.6	0	80	1	15	420	259°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 1

Route	September						October						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
Seattle to Sitka.	Variable, SE.-NW.	15.6	20-40	55	3	16	S.-SE.	20	10-30	50	7	18	705	320°
Sitka to Kodiak.	Variable, SE.-W.	20	15-20	52	11	11	Variable, E.	24.3	0	40	9	15	600	275°
Kodiak to Unalaska.	Variable, SW.	20	15-30	52	11	9	NW.	24.3	0	43	8	7	540	244°
Unalaska to Petropavlovsk.	Variable,	24.3	30-40	52	10	7	Variable, W.	24.3	0	40	12	7	1260	267°
Petropavlovsk to Yokohama.	Variable.	24.3	40	70	9	14	Variable, W.	24.3	10-15	50	6	11	1380	217°
Yokohama to Nagasaki.	Variable.	20	0	77	2	16	Variable.	20	0	70	5	9	510	252°
Nagasaki to Shanghai.	NE.	20	0	77	2	10	NE.	20	0	70	2	6	420	259°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 1

Route	November						December						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
Seattle to Sitka.	SE.	20	10-20	40	2	9	S.-SE.	24.3	10-15	35	15	15	705	320°
Sitka to Kodiak.	E.-SE.	15.6	0	35	1	15	Variable.	24.3	0	30	11	16	600	275°
Kodiak to Unalaska.	NW.	24.3	0	35	13	0	W.-NW.	24.3	0	33	16	8	540	244°
Unalaska to Petropavlovsk.	W.	29.5	0	30	20	2	W.	24.3	0	28	25	4	1260	267°
Petropavlovsk to Yokohama.	W.-NW.	24.3	0	35	20	6	NW.	29.5	0	40	20	4	1380	217°
Yokohama to Nagasaki.	N.	15.6	0	55	4	10	NW.	24.3	0	55	6	12	510	252°
Nagasaki to Shanghai.	N.-NE.	15.6	0	55	1	18	NW.	15.6	0	50	3	34	420	259°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

route is well within the range of flight of several of the types of aircraft already constructed. The longest sections are from Unalaska to Petropavlovsk, and from Petropavlovsk to Yokohama. If it appears desirable these may be divided into shorter sections. Between Unalaska and Petropavlovsk is the island of Attu. If a stop were made at this point it would divide the 1260 nautical miles from Unalaska to Petropavlovsk into two sections, one of 765 nautical miles, between Unalaska and Attu, and the other, 525 nautical miles, between Attu and Petropavlovsk.

Attu Island.—A wild rocky island at the extreme end of the Aleutian Island chain. There are two small harbors which afford good shelter for vessels of less than 14 feet draft. The island would offer no landing places for land machines. No supplies would be available at this point. (United States possession.)

The section of the route from Petropavlovsk to Yokohama could be divided by making a landing at Nemuro in northern Japan. This would make two sections, one from Petropavlovsk to Nemuro, of 825 nautical miles, and the other, from Nemuro to Yokohama, of 605 nautical miles.

Nemuro.—Has good harbor facilities, but is subject to extreme changes of temperature. The temperature varies between a maximum of 90° F. in July and a minimum of −8° F. in February. General supplies would be available at this point, and a wireless station is located at Otchisi, a few miles to the southeast of Nemuro. (Japanese village.)

In studying the tables for Route 1 it is seen that for a flight from the American coast to the Asiatic coast, head winds would be encountered along the section of the route from Unalaska to Petropavlovsk throughout the months from January to April inclusive, and from October to December inclusive. During the remaining months of the year the winds are variable. During the months of May, June, July, August and September, there are very high percentages of days with fog, varying from a minimum of 15 per cent in the month of May to a maximum of 50 per cent in the months of June and July. These two conditions, and the extreme low temperatures encountered at Petropavlovsk from November to May, would tend to make this northern route very undesirable for any type of machine which has thus far been constructed.

Route 2—the Central Route—is from San Francisco to Honolulu, thence to Jaluit, to Guam, to Manila and to Hongkong. The total distance to be flown in following this route is 7690 nautical miles. The landing places may be described briefly as follows:

San Francisco.—Has excellent harbor facilities and landing fields for all types of machines, both lighter-than-air and heavier-than-air. The temperature range is from a maximum of 100° F. in June to a minimum of 29° F. in January. Fogs are likely to prevail over San Francisco Bay in any month of the year. The days of fog are a minimum during the winter months of December, January, February and March.

Honolulu.—As has been stated before, Honolulu provides excellent landing facilities for all types of aircraft. Supplies are abundant, and the temperature range is from a maximum of 86° F. in August and September to a minimum of 57° F. in January. (United States possession.)

Jaluit.—Provides good harbor facilities with plenty of depth, but probably would not provide good landing fields for land machines. The harbor is in the form of a lagoon, surrounded by low coral islands. Coal, water and ships' provisions are available, but other supplies are limited. The temperature range is very much the same as that of Honolulu; maximum and minimum figures are not available, but the average monthly temperatures are 80° F. and 81° F. throughout the year. (Originally German possession, awarded to Japan by Peace Treaty.)

Guam.—Provides anchorages for all classes of vessels, and at Port Apra, on the west coast, has mooring buoys for the use of United States naval vessels. General supplies and water can be obtained, but coal facilities are not good. A United States naval radio station is established here. Maximum and minimum temperatures are not available, but the average monthly temperatures vary from 78° F. to 82° F. (United States possession.)

Manila.—Excellent harbor facilities are available for all types of vessels, and landing fields for land machines and lighter-than-air craft. Supplies of all kinds are available. The temperature range is from a maximum of 102° F. in May to a minimum of 63° F. in January and February. (United States possession.)

Hongkong.—Has excellent harbor facilities for all types of water-craft, and could probably provide, in the public parks, landing fields for land machines and lighter-than-air craft. Supplies of all kinds are available. Temperature range is from a maximum of 97° F. in August to a minimum of 32° F. in January. (British colony.)

The tables for Route 2 show the weather conditions for different sections of that route. It will be noted that the distance to be flown from San Francisco to Honolulu is 2090 nautical miles, and from Honolulu to Jaluit, 2150 nautical miles, exceeding the distance covered thus far in any non-stop flight with heavier-than-air machines. The only machines which have covered greater distances in non-stop flights are the rigid airships of the types of the German *L-49* and *L-53*, and the British *R-34*. The distance from Jaluit to Guam, may, if necessary, be divided into shorter sections, because of the fact that the course passes over the Marshall and the Caroline Islands, where several landing places could be found in case of need. In the section from Guam to Manila, suitable landing places could be found, in case of need, among the most easterly islands of the Philippine group, by making only a slight deviation from the course.

The portions of this route from San Francisco to Honolulu, to Jaluit and Guam are within the region covered by the northeast trades. With very few exceptions, the northeast trades prevail throughout each of these sections during the entire year. These winds vary in strength from 15 to 24 nautical miles per hour, and could be counted on to give material aid in the flight from San Francisco to Honolulu and from Honolulu to Jaluit. In these sections of the route the course followed is almost directly in line with the direction of the northeast trades. In the sections from Jaluit to Guam and Guam to Manila, the course would be across the direction of the winds. From Manila to Hongkong the winds are variable, due to the changes from winter monsoons to summer monsoons, and vice versa.

This route is practically free from fog at all periods of the year. The only portion of the route subject to fog is that in the region of San Francisco. The fogs here extend a few hundred miles out to sea, and it would always be possible to choose a day for starting from San Francisco when fog conditions would not interfere with flight.

ROUTE 2

(Total Distance 7690 Nautical Miles)

Route	January Condition						February Condition						Distance, nautical miles	True bearing
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	NE.	20	15	57	5	10	Variable.	20	10–20	60	4	10	2090	244°
Honolulu to Jaluit.	NE.	20	0	75	1	4	NE.	20	0	75	2	5	2130	250°
Jaluit to Guam.	NE.	20	0	80	0	3	NE.	20	0	78	0	4	1490	279°
Guam to Manila.	NE.	20	0	80	3	10	NE.	20	0	80	0	8	1380	273°
Manila to Hongkong.	NE.	24.3	0	75	1	11	NE.	24.3	0	70	3	4	600	321°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 2

Route	March Condition						April Condition						Distance, nautical miles	True bearing
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	Variable, NE.	20	10–15	65	4	10	NE.	15.6	15–20	60	1	2	2090	244°
Honolulu to Jaluit.	NE.	20	0	78	2	4	NE.	24.3	0	75	1	3	2130	250°
Jaluit to Guam.	NE.	24.3	0	80	0	3	NE.	24.3	0	80	0	7	1490	279°
Guam to Manila.	NE.	20	0	80	0	6	NE.-E.	20	0	80	0	10	1380	273°
Manila to Hongkong.	NE.	20	0	80	1	12	Variable.	15.6	0	80	0	18	600	321°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 2

Route	May						June						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	NE.	15.6	15	67	2	14	NE.	20	10–30	67	3	14	2090	244°
Honolulu to Jaluit.	NE.	24.3	0	80	0	1	NE.	20	0	77	2	8	2130	250°
Jaluit to Guam.	NE.	24.3	0	80	0	12	NE.	20	0	80	0	18	1490	279°
Guam to Manila.	NE.-E.	20	0	80	0	18	E.-S.	20	0	80	3	13	1380	273°
Manila to Hongkong.	Variable.	15.6	0	80	0	31	S.-SW.	20	0	80	3	19	600	321°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 2

Route	July						August						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	NE.	15.6	15–25	72	0	10	NE.	20	10–30	72	2	9	2090	244°
Honolulu to Jaluit.	NE.	24.3	0	80	0	6	NE.	20	0	80	0	7	2130	250°
Jaluit to Guam.	NE.-E.	20	0	80	1	20	SE.	15.6	0	80	0	35	1490	279°
Guam to Manila.	Variable, NE.-SW.	20	0	80	3	25	Variable, SW.	20	0	80	2	11	1380	273°
Manila to Hongkong.	S.-SW.	20	0	80	3	17	Variable, NE.-SW.	20	0	80	2	13	600	321°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 2

Route	September						October						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	NE.	20	10–40	70	0	14	NE.	20	10–30	67.5	2	15	2090	244°
Honolulu to Jaluit.	Variable, NE.–SE.	20	0	80	0	11	NE.	20	0	80	1	2	2130	250°
Jaluit to Guam.	E.–SE.	15.6	0	80	0	15	NE.	20	0	80	0	21	1490	279°
Guam to Manila.	Variable, SW.	20	0	80	3	14	Variable.	15.6	0	80	0	23	1380	273°
Manila to Hongkong.	Variable, NE.	20	0	80	3	12	NE.	20	0	80	4	12	600	321°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 2

Route	November						December						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	NE.	20	10–20	70	4	10	Variable, SE.	20	10–15	60	5	11	2090	244°
Honolulu to Jaluit.	NE.	20	0	80	0	5	NE.	24.3	0	75	3	9	2130	250°
Jaluit to Guam.	NE.	20	0	80	0	9	NE.	20	0	80	0	4	1490	279°
Guam to Manila.	NE.	20	0	80	3	12	NE.	20	0	80	1	4	1380	273°
Manila to Hongkong.	N.–NE.	29.5	0	75	7	5	NE.	24.3	0	70	1	6	600	321°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

A study of the conditions which are found on Route 2 would indicate that at the present time there is no type of heavier-than-air machine which could accomplish the flight from San Francisco to Honolulu, or from Honolulu to Jaluit, without refueling somewhere en route. This would limit this course for heavier-than-air machines to some type of seaplane, probably of the *NC* type, or something larger when larger machines are constructed. It would be possible to accomplish this flight with lighter-than-air machines of the rigid airship types mentioned previously, either the German *L-53* or the British *R-34*. Under certain conditions, it is probable that the non-rigid airship of the type of the *C-5*, which was wrecked at Newfoundland while being prepared for the trans-Atlantic flight, could cover the distances required for this route. This question will be discussed later.

Route 3—the South Central Route—follows very closely Route 2. Starting from San Francisco the course is laid to Honolulu, thence to Johnston Islands, to Jaluit, to Truk in the Caroline Islands, to Yap in the Pelew group, to Cebu in the Philippines, to Manila and to Hongkong. The total distance covered in this flight is 7899 nautical miles, an increase of 209 miles over that of Route 2. The advantage of this route in comparison with Route 2 is that the distances to be covered in non-stop flight are made much less, because of making use of a greater number of landing places. The landing places on this route, other than those described in connection with Route 2, have the following characteristics:

Johnston Islands.—A coral reef about eight miles in length, and coral ledges, enclosing a lagoon. The coral ledges, extending in a northeasterly direction, are well defined by breakers. The lagoon forms an anchorage which is well sheltered from the northeast trades, but is exposed to winds varying from east to southwest. No supplies of any kind would be available at this point. The only possibility of use of the islands would be to form an anchorage for a mother ship from which supplies for seaplanes could be obtained. No landing facilities for land machines or lighter-than-air craft would be available.

Truk (also known as Hogulu).—A small group of islands consisting of 10 lofty basaltic islands and numerous coral islands inclosing a lagoon about 46 x 40 miles in extent. The

lagoon provides good anchorage in any portion. No supplies would be available, and it is reported that the natives on some of the islands are inclined to head-hunting. Here again, the only landing facilities would be for seaplanes where supplies could be obtained from a mother ship. (Formerly a German possession, awarded to Japan by Peace Treaty.)

Yap.—A small island of volcanic origin with a maximum elevation of 1050 feet. Good harbor facilities are provided on the west coast, and coal and water are available. From November to May the island is in the track of the northeast trades, during the remainder of the year it is subject to occasional typhoons. The average monthly temperature range is from 80° F. to 82° F. (Formerly German possession, to be awarded to United States of America by Peace Treaty.)

Cebu.—An important commercial port on the east coast of the island of Cebu, provides an excellent harbor and has facilities for all kinds of repairs. A marine railway is available here which would make possible the docking of seaplanes of the *NC* type in case of need. The surrounding country has numerous sugar plantations, and it is probable that a land machine could be brought down without entirely wrecking the plane, if a suitable landing field could not be found in the city. (United States possession.)

The tables for Route 3 show the meteorological conditions which obtain in all sections of the South Central Route. Conditions vary very little from those which have already been described for the Central Route—Route 2. As has been noted previously, the main advantage of this route over Route 2 is in the shorter distances to be covered in non-stop flight. The only lap which is not shortened is that from San Francisco to Honolulu.

If provisions could be made for the refueling of seaplanes at sea it would be possible for flying boats of the *NC* type to cover the distance from San Francisco to Honolulu with one refueling. Distances between landing places beyond Honolulu could be covered by machines of this type in non-stop flight.

Route 4—the North Central Route—deviates quite considerably in the central portion from Routes 2 and 3. As with Routes 2 and 3, the first section would be from San Francisco to Honolulu; from Honolulu the route would be to the Midway Islands, from the Midway Islands to Wake, thence to Guam, to Yap, to Cebu, to

ROUTE 3

(Total Distance 7899 Nautical Miles)

Route	January						February						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	NE.	20	15	57	5	10	Variable.	20	10–20	60	4	10	2090	244°
Honolulu to Johnston Is.	NE.	20	0	75	1	4	NE.	20	0	75	2	5	720	247°
Johnston Island to Jaluit.	NE.	20	0	75	1	4	NE.	20	0	75	2	5	1410	243°
Jaluit to Truk Island.	NE.	20	0	80	0	3	NE.	20	0	78	0	4	1080	274°
Truk Island to Yap Island.	NE.	20	0	80	0	3	NE.	20	0	78	0	4	825	279°
Yap Island to Cebu.	NE.	20	0	80	0	12	NE.	20	0	78	0	7	864	273°
Cebu to Manila.	NE.	20	0	80	0	24	NE.	15.6	0	78	0	11	310	324°
Manila to Hongkong.	NE.	24.3	9	75	1	21	NE.	24.3	0	70	3	4	600	326°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 3

Route	March						April						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	Variable, NE.	20	10–15	65	4	10	NE.	15.6	15–20	60	1	2	2090	244°
Honolulu to Johnston Is.	NE.	20	0	78	2	4	NE.	24.3	0	75	1	3	720	247°
Johnston Island to Jaluit.	NE.	20	0	78	2	4	NE.	24.3	0	75	1	3	1410	243°
Jaluit to Truk Island.	NE.	24.3	0	80	0	3	NE.	24.3	0	80	0	7	1080	274°
Truk Island to Yap Island.	NE.	24.3	0	80	0	3	NE.	24.3	0	80	0	7	825	279°
Yap Island to Cebu.	NE.	20	0	80	0	7	NE.	20	0	80	0	14	864	273°
Cebu to Manila.	NE.	20	0	80	0	10	NE.	20	0	80	0	18	310	324°
Manila to Hongkong.	NE.	20	0	80	1	12	Variable, N.-NE.	15.6	0	80	0	18	600	326°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 3

Route	May						June						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	NE.	15.6	15	67	2	14	NE.	20	10–30	67	3	14	2090	244°
Honolulu to Johnston Is.	NE.	24.3	0	80	0	1	NE.	20	0	77	2	8	720	247°
Johnston Island to Jaluit.	NE.	24.3	0	80	0	1	NE.	20	0	77	2	8	1410	243°
Jaluit to Truk Island.	NE.	24.3	0	80	0	12	NE.	20	0	80	0	18	1080	274°
Truk Island to Yap Island.	NE.	24.3	0	80	0	12	NE.	20	0	80	0	18	825	279°
Yap Island to Cebu.	NE.	20	0	80	0	21	NE.	15.6	0	80	0	36	864	273°
Cebu to Manila.	Variable.	15.6	0	80	0	21	Variable, S.-SW.	15.6	0	80	1	22	310	324°
Manila to Hongkong.	Variable.	15.6	0	80	0	31	S.-SW.	20	0	80	3	19	600	326°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 3

Route	July						August						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	NE.	15.6	15–25	72	0	10	NE.	20	10–30	72	2	9	2090	244°
Honolulu to Johnston Is.	NE.	24.3	0	80	0	6	NE.	20	0	80	0	7	720	247°
Johnston Island to Jaluit.	NE.	24.3	0	80	0	6	NE.	20	0	80	0	7	1410	243°
Jaluit to Truk Island.	NE.-E.	20	0	80	1	20	SE.	15.6	0	80	0	35	1080	274°
Truk Island to Yap Island.	NE.-E.	20	0	80	1	20	SE.	15.6	0	80	0	35	825	279°
Yap Island to Cebu.	S.-SW.	15.6	0	80	0	38	SW.	24.3	0	80	0	16	864	273°
Cebu to Manila.	SW.	20	0	80	1	24	SW.	15.6	0	80	1	22	310	324°
Manila to Hongkong.	S.-SW.	20	0	80	3	17	Variable, NE.-SW.	20	0	80	2	13	600	326°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 3

Route	September Condition A	B	C	D	E	F	October Condition A	B	C	D	E	F	Distance, nautical miles	True bearing
San Francisco to Honolulu.	NE.	20	10–40	70	0	14	NE.	20	10–30	67.5	2	15	2090	244°
Honolulu to Johnston Is.	NE.–SE.	20	0	80	0	11	NE.	20	0	80	1	2	720	247°
Johnston Island to Jaluit.	NE.–SE.	20	0	80	0	11	NE.	20	0	80	1	2	1410	243°
Jaluit to Truk Island.	E.–SE.	15.6	0	80	0	15	NE.	20	0	80	0	21	1080	274°
Truk Island to Yap Island.	N.–S.	20	0	80	0	16	Variable, SE.–NW.	15.6	0	80	0	28	825	279°
Yap Island to Cebu.	SW.	20	0	80	3	17	Variable.	15.6	0	80	0	38	864	273°
Cebu to Manila.	SW.	20	0	80	2	13	Variable, NE.	15.6	0	80	0	17	310	324°
Manila to Hongkong.	Variable, NE.	20	0	80	3	12	NE.	20	0	80	4	13	600	226°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

ROUTE 3

Route	November Condition A	B	C	D	E	F	December Condition A	B	C	D	E	F	Distance, nautical miles	True bearing
San Francisco to Honolulu.	NE.	20	10–20	70	4	10	Variable, SE.	20	10–15	60	5	11	2090	244°
Honolulu to Johnston Is.	NE.	20	0	80	0	5	NE.	24.3	0	75	3	9	720	247°
Johnston Island to Jaluit.	NE.	20	0	80	0	5	NE.	24.3	0	75	3	9	1410	243°
Jaluit to Truk Island.	NE.	20	0	80	0	9	NE.	20	0	80	0	4	1080	274°
Truk Island to Yap Island.	NE.	15.6	0	80	0	13	NE.	20	0	80	3	7	825	279°
Yap Island to Cebu.	Variable.	15.6	0	80	1	20	NE.	20	0	80	3	8	864	273°
Cebu to Manila.	NE.	15.6	0	80	1	15	NE.	15.6	0	80	2	25	310	324°
Manila to Hongkong.	N.–NE.	29.5	0	75	7	5	NE.	24.3	0	70	1	5	600	325°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days of calms, light airs and variable winds.

Manila and Hongkong. The total distance covered in following this route would be 7811 nautical miles, practically an average between the Central and the South Central Routes. Here again, the advantage in comparison with the Central Route would be a decrease in the distance to be covered in non-stop flight. Another advantage would lie in the fact that all landing places, except Hongkong, would be at points either belonging to or under the control of the United States Government.

Those landing places not already described in connection with the routes discussed previously will be described as follows:

Midway Islands.—A group of islands offering good harbor facilities during the summer months, but too small and too uneven to offer landing facilities for land machines, or for lighter-than-air machines unless moored to a mast. A few supplies would be available, but the main purpose of the use of this island as a landing place would be to offer shelter for a mother ship from which supplies could be obtained. There is always a rough westerly sea and from October to April there are only occasional days of fine weather. (United States possession.)

Wake Island.—A low coral island about eight feet above normal sea level, inclosing a large lagoon which would offer shelter for anchorage except in most severe weather. During severe storms the sea breaks completely over the island. No supplies or provisions are available, and the only advantage of landing at this point would be to obtain supplies from a mother ship anchored in the lagoon. (United States possession.)

The meteorological conditions obtaining along the North Central Route are shown in the tables for Route 4. As has been noted previously, the only advantages of this route in comparison with Route 2 are a decrease in the distances to be covered in non-stop flight, and the fact that all landing places except one are under the control of the United States Government. This latter consideration is probably the only advantage that Route 4 would show in comparison with Route 3.

Route 5—the Lighter-Than-Air Route—at the present time available for lighter-than-air craft only, would be from San Francisco to Honolulu, thence to Guam, to Manila and to Hongkong.

ROUTE 4

(Total Distance 7811 Nautical Miles)

Route	January						February						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	NE.	20	15	57	5	10	Variable.	20	15-20	60	4	10	2090	244°
Honolulu to Midway Is.	E.-S.	20	0	70	2	9	E.-NE.	24.3	0	70	3	10	1140	292°
Midway Is. to Wake Island.	NE.	20	0	72	3	14	Variable.	20	0	72	5	10	1050	240°
Wake Island to Guam.	NE.	20	0	75	3	7	NE.	20	0	75	0	8	1300	254°
Guam to Yap....	NE.	20	0	80	1	5	NE.	20	0	80	0	8	457	240°
Yap to Cebu.....	NE.	20	0	80	0	12	NE.	20	0	78	0	7	864	273°
Cebu to Manila.	NE.	20	0	80	0	24	NE.	15.6	0	78	0	11	310	324°
Manila to Hongkong.	NE.	24.3	0	75	1	11	NE.	24.3	0	70	3	4	600	326°

A—Direction prevailing wind.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days with calms, light airs and variable winds.

ROUTE 4

Route	March						April						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	Variable, NE.	20	10-15	65	4	10	NE.	15.6	10-20	60	1	12	2090	244°
Honolulu to Midway Is.	NE.	20	0	72	2	10	NE.	15.6	0	70	1	10	1140	292°
Midway Is. to Wake Island.	NE.	20	0	75	2	10	NE.	20	0	72	0	9	1050	240°
Wake Island to Guam.	NE.	20	0	80	0	3	NE.	20	0	75	1	5	1300	254°
Guam to Yap....	NE.	20	0	80	0	5	NE.	20	0	80	0	9	457	240°
Yap to Cebu.....	NE.	20	0	80	0	7	NE.	20	0	80	0	14	864	273°
Cebu to Manila.	NE.	20	0	80	0	10	NE.	20	0	80	0	18	310	324°
Manila to Hongkong.	NE.	20	0	80	1	12	Variable, N.-NE.	15.6	0	80	0	18	600	326°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days with calms, light airs and variable winds.

ROUTE 4

Route	May						June						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	E		
San Francisco to Honolulu.	NE.	15.6	15	67	2	14	NE.	20	15–30	67	3	14	2090	244°
Honolulu to Midway Is.	NE.	20	15	75	0	12	NE.	15.6	0	75	0	13	1140	292°
Midway Is. to Wake Island.	NE.	20	0	77	0	9	NE.	20	0	77	0	14	1050	240°
Wake Island to Guam.	NE.	20	0	80	0	6	NE.	15.6	0	80	0	8	1300	254°
Guam to Yap....	NE.–E.	15.6	0	80	0	13	NE.–E.	15.6	0	80	0	12	457	240°
Yap to Cebu.....	NE.	20	0	80	0	21	NE.	15.6	0	80	0	36	861	273°
Cebu to Manila.	Variable.	15.6	0	80	0	21	Variable, S.–SW.	15.6	0	80	1	22	310	324°
Manila to Hongkong.	Variable.	15.6	0	80	0	31	S.–SW.	20	0	80	3	19	600	326°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days with calms, light airs and variable winds.

ROUTE 4

Route	July						August						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	NE.	15.6	15–25	72	0	10	NE.	20	10–30	72	2	9	2090	244°
Honolulu to Midway Is.	NE.	20	0	77	0	7	NE.	20	0	80	0	9	1140	292°
Midway Is. to Wake Island.	NE.	20	0	80	0	12	NE.	15.6	0	80	0	9	1050	240°
Wake Island to Guam.	NE.	20	0	80	1	14	E.–SE.	15.6	0	80	0	14	1300	254°
Guam to Yap....	NE.	15.6	0	80	2	25	NE.–SW.	20	0	80	0	11	457	240°
Yap to Cebu.....	S.–SW.	15.6	0	80	0	38	SW.	24.3	0	80	0	16	864	273°
Cebu to Manila.	SW.	20	0	80	1	24	SW.	15.6	0	80	1	22	310	324°
Manila to Hongkong.	S.–SW.	20	0	80	3	17	Variable, NE.–SW.	20	0	80	2	13	600	326°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days with calms, light airs and variable winds.

ROUTE 4

Route	September						October						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	NE.	20	10-40	70	0	14	NE.	20	10-20	67.5	2	15	2090	244°
Honolulu to Midway Is.	NE.	20	0	80	0	16	NE.	20	0	75	2	8	1140	292°
Midway Is. to Wake Island.	NE.	20	0	80	0	13	NE.	20	0	77	0	10	1050	240°
Wake Island to Guam.	E.-NE.	20	0	80	0	15	NE.	20	0	80	0	16	1300	254°
Guam to Yap....	Variable.	20	0	80	0	17	NE.	11.3	0	80	0	13	457	240°
Yap to Cebu.....	SW.	20	0	80	3	17	Variable.	15.6	0	80	0	38	864	273°
Cebu to Manila.	SW.	20	0	80	2	13	Variable. NE.	15.6	0	80	0	17	310	324°
Manila to Hongkong.	Variable, NE.	20	0	80	3	12	NE.	20	0	80	4	12	600	326°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days with calms, light airs and variable winds.

ROUTE 4

Route	November						December						Distance, nautical miles	True bearing
	Condition						Condition							
	A	B	C	D	E	F	A	B	C	D	E	F		
San Francisco to Honolulu.	NE.	20	10-15	65	4	10	SE.	20	10-15	65	5	11	2090	244°
Honolulu to Midway Is.	NE.	20	0	72.5	1	7	NE.	15.6	0	70	2	10	1140	202°
Midway Is. to Wake Island.	NE.	20	0	75	1	2	NE.	20	0	70	0	9	1050	240°
Wake Island to Guam.	NE.	20	0	77.5	2	6	NE.	20	0	75	0	5	1300	254°
Guam to Yap....	NE.	20	0	80	0	9	NE.	20	0	80	1	3	457	240°
Yap to Cebu....	Variable.	15.6	0	80	1	20	NE.	20	0	80	3	8	864	273°
Cebu to Manila.	NE.	15.6	0	80	1	15	NE.	15.6	0	80	2	25	310	324°
Manila to Hongkong.	N.-NE.	29.5	0	75	7	5	NE.	24.3	0	80	1	5	600	226°

A—Direction prevailing winds.
B—Wind velocities, knots.
C—Percentage of days with fog.
D—Average monthly temperatures, degrees F.
E—Percentage of days of gales of 41.6 knots and above.
F—Percentage of days with calms, light airs and variable winds.

The total distance covered would be 7440 nautical miles, 250 miles less than the distance flown along Route 2. Meteorological conditions would vary very little from those previously described for that route. The longest non-stop flight would be from Honolulu to Guam, a distance of 3400 nautical miles. Detailed meteorological data are unnecessary.

SUMMARY

The study of the information available regarding the five routes which have been outlined for the trans-Pacific flight shows certain characteristics which should be considered in choosing a route to be followed:

First.—The Northern Route, while offering the advantages of short distances to be covered in non-stop flight, is subject to the disadvantages of extreme cold during months from October to May and subject to extreme fog conditions during the months from May to September inclusive. These two conditions make an attempt at flight following this course inadvisable. If the only object of such a flight were to win fame and a cash prize, it is possible that, by watching until conditions were right, the flight could be accomplished, following this route, by some type of seaplane. The route is not suitable for land machines unless a flight were accomplished during the winter months when landings could be made on the ice. This ice condition, however, is very uncertain at some of the proposed landing places, and the possibility of a successful flight being made with such a machine is very small. Commercially, the route would have little value.

Second.—Route 2, because of the long distances to be covered in non-stop flight, is unsuited for any type of heavier-than-air machine which has been thus far constructed. It might be possible to accomplish flight following this route if provisions were made for refueling machines of the *NC* type at sea. Flight along this route could be accomplished by a rigid airship of the *R-34* type.

Third.—Routes 3 and 4 offer advantages of shorter non-stop flights, as compared with Route 2. It should be noted, however, that there is no way of decreasing the distance from

San Francisco to Honolulu, and any machine capable of flight between these points could cover the distances necessary for the flight between all other landing places in Route 2. Route 4 has the advantage of all landing places, except Hongkong, being under United States Government control. It might be desirable to make a combination of Routes 2 and 4, the courses being laid from San Francisco to Honolulu, to Midway, to Wake, to Guam, to Manila and to Hongkong.

Fourth.—Route 5, due to the long non-stop flights to be accomplished, would be suitable for large lighter-than-air craft only. Several rigid airships are now in use in Europe which could cover these distances. This route has the advantage of all landing points, except Hongkong, being under United States control. It might be feasible to make this a main route, with emergency mooring towers located at Midway Islands, at Yap (if this island becomes United States property) and at Cebu. The station at the Midway Islands might also be used as a landing point on flights from Honolulu to Yokohama, a total distance of 3400 nautical miles.

A study of the weather conditions along Route 2 shows that during the months of January, February and March the northeast trades are practically constant in velocity over the entire course from San Francisco to Guam. This is a period of the year when typhoons are a minimum, so that the course from Guam to Manila and from Manila to Hongkong would be practically free from the influence of these storms. These months, and particularly the month of February, would be the most suitable for attempting a flight following this course. This flight could easily be accomplished with a rigid airship of the *R-34* type, and it is probable that it could be accomplished by a non-rigid airship of the *C-5* type, if especially equipped for the flight. The following calculations, based upon information obtained from an article published by Commander Hunsaker in *Aviation* of September 1, 1919, show the possibilities of the *C-5* type non-rigid airship in accomplishing this flight.

The endurance of the *C-5* as equipped for the flight from Montauk to Newfoundland was 47 hours, at a cruising speed of 40 nautical miles per hour. This gives a cruising range of 1880 nautical miles. This range is somewhat less than the distance to

be covered between San Francisco and Honolulu, and between Honolulu and Jaluit. If, however, the assistance due to the northeast trades, which have a constant velocity through the month of February of 20 nautical miles per hour, be counted upon, we find that the cruising range would be increased from 1880 to 2820 nautical miles. This gives a cruising range more than sufficient to accomplish the flights mentioned above. The following calculations have been made to determine the time necessary for the flight for each section of this route. It is found in each case that the time of flight is much less than the endurance of the machine, because of the assistance of the northeast trades.

THE U. S. NAVY NON-RIGID AIRSHIP "C-2," SISTER SHIP TO THE "C-5," WHICH WAS LOST AT SEA OFF NEWFOUNDLAND WHILE BEING MADE READY FOR A TRANS-ATLANTIC FLIGHT.

Time, San Francisco to Honolulu	34.8 hours.
Time, Honolulu to Jaluit	35.5 hours.
Time, Jaluit to Guam	26.4 hours.
Time, Guam to Manila	24.7 hours.
Time, Manila to Hongkong	17.3 hours.
Total flying time, San Francisco to Hongkong,	138.7 hours.

In case the fuel supply should be exhausted, because of adverse winds, or for any other reason, it would be possible for the airship to summon a destroyer by wireless, and refuel and replenish water ballast and gas from the destroyer at sea.

In calculating the times listed above, allowances have been made in all cases for both the direction and the velocity of the winds that

would prevail over the different sections of the course. These, of course, would vary during different days of the month, but it is probable that the calculated time would not be more than 10 per cent in error.

It should be noted that the wind velocity given in the tables and used in the above calculation, are those that prevail at water level, as shown by the monthly pilot charts for the North Pacific Ocean, published by the Hydrographic Office. Wind velocities and directions at high altitudes may be very different. In general, wind directions gradually change with increase of altitude, so that for altitudes of 1 mile it is found that all winds are from the west of north or south, and above 2 miles, all winds are decidedly from the west. (Report 13, National Advisory Committee for Aeronautics.) This would indicate that for flights from America to Asia, low altitudes should be kept, to take advantage of the northeast trades; and for flights in the opposite direction, maximum altitudes consistent with the design of the machine should be attained.

As has been noted previously, the main advantage of Routes 3 and 4 in comparison with Route 2 is in having shorter distances to be accomplished in non-stop flight. These routes would not be suitable for land machines, because of no landing facilities being available at the intermediate stopping points. They could be used only for seaplanes, and would require a refueling at sea, at some point between San Francisco and Honolulu, for any type of seaplane yet constructed.

CONCLUSIONS

The conclusion reached through the study of the possible routes as described previously is that there is no type of heavier-than-air machine in use at the present time which could accomplish the trans-Pacific flight, without refueling at sea, unless Route 1 were followed. Flight over this course does not appear advisable, because of adverse weather conditions. Temperature conditions are favorable along all routes except Route 1. Fog might delay flight along the Central Routes only at San Francisco.

Lighter-than-air craft could accomplish the flight following Routes 2 or 5, and the month in which weather conditions would be best for this flight would be in the month of February. It would not be wise to attempt flights with lighter-than-air machines dur-

ing the months of June, July, August and September, because of the frequency and severity of typhoons likely to be encountered between Guam and Manila, and between Manila and Hongkong. A lighter-than-air craft of the type of the *R-34*, having cruised over Route 2 or Route 5 during the month of February, could, by going inland a short distance from Hongkong, work its way up the China coast to Shanghai, and then across to Japan. Following a course practically along the 45th parallel, north latitude, it would find, during the month of March, westerly winds which would make it possible for the ship to accomplish a non-stop flight from Japan to Seattle or Vancouver. The distance to be covered in this flight is approximately 4200 nautical miles. This distance is approximately the same as that covered by the German rigid airship mentioned previously, in the flight from Bulgaria to Khartoum and back, without regassing or refueling. By going to higher altitudes to avoid storms, flights as just outlined could probably be accomplished by lighter-than-air craft at any season of the year.

AUSTRALIAN FLIGHT

It might be interesting to note that the distance from San Francisco to Charlotte Bay, on the north coast of Australia, following the course from San Francisco to Honolulu, to Jaluit and to Charlotte Bay, is 6215 nautical miles. The distance from Jaluit to Charlotte Bay is 1965 nautical miles, less than the distance from San Francisco to Honolulu. This would indicate that any type of machine which could accomplish the flight from San Francisco to Jaluit could continue the flight from Jaluit to Australia without special difficulty. There are possibilities of landing places being found between Jaluit and Charlotte Bay, among some of the Solomon Islands, or at some point on the coast of New Guinea. The *Aerial Age* of February 9, 1920, reported that an officer of the British Royal Flying Corps is at present making preparations for a flight from Australia to San Francisco, following this route reversed.

Another possible route would be across the South Pacific from Valparaiso, Chile, to Townsville, Australia. This route would be divided into four sections: (1) From Valparaiso to the Easter Islands, a distance of 2000 nautical miles; (2) from Easter Islands

MONTHLY TEMPERATURE CHART, DEGREES FAHRENHEIT

Location	January			February			March			April			May			June			July			August			September			October			November			December			Yearly	
	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.
Cebu	89	70	77	90	72	79	91	72	81	90	74	83	95	74	83	93	72	83	94	73	83	93	70	82	93	70	83	92	72	82	93	74	82	90	73	81	95	70
Guam	..	..	78	..	..	79	..	..	80	..	..	81	..	..	82	..	..	82	..	..	81	..	..	81	..	..	80	..	..	80	..	..	79	..	..	78	..	..
Hongkong	79	32	60	79	38	58	82	46	63	89	52	70	92	62	77	94	69	81	94	72	82	97	72	81	94	66	80	94	57	76	86	47	69	82	41	62	97	32
Honolulu	82	57	71	80	62	71	82	62	71	80	64	72	83	65	75	84	69	77	84	70	78	86	70	79	86	72	78	85	70	76	83	67	74	80	63	72	86	57
Jaluit	..	..	81	..	..	81	..	..	81	..	..	80	..	..	80	..	..	80	..	..	80	..	..	80	..	..	81	..	..	81	..	..	81	..	..	80	..	..
Kodiak	..	..	30	..	..	28	..	..	33	..	..	36	..	..	43	..	..	50	..	..	55	..	..	55	..	..	50	..	..	42	..	..	35	..	..	31	..	..
Manila	91	63	77	94	63	78	98	66	80	100	69	83	102	73	83	98	74	82	97	72	81	91	72	81	92	72	80	93	72	80	93	70	79	90	68	78	102	63
Nagasaki	..	..	43	..	..	43	..	..	49	..	..	58	..	..	64	..	..	71	..	..	78	..	..	80	..	..	75	..	..	65	..	..	55	..	..	44	98	23
Nemuro	..	..	24	..	..	23	..	..	28	..	..	38	..	..	44	..	..	50	..	..	58	..	..	63	..	..	60	..	..	51	..	..	40	..	..	30	90	−8
Ponape	..	..	81	..	..	81	..	..	81	..	..	81	..	..	81	..	..	81	..	..	80	..	..	81	..	..	80	..	..	80	..	..	79	..	..	79	..	..
Petropavlovsk	28	−6	12	32	−7	19	37	−5	23	45	21	32	49	29	38	64	34	46	74	41	56	68	41	53	72	33	51	52	27	41	44	13	27	32	1	19	74	−7
San Francisco	73	29	50	80	33	54	80	33	55	88	40	57	97	43	59	100	47	59	93	47	59	92	46	61	94	47	60	94	45	56	83	38	51	72	34	51	100	29
Seattle	62	3	41	67	4	42	81	20	45	85	32	50	92	37	55	96	41	60	91	46	64	92	46	64	87	36	58	81	31	52	68	15	46	62	26	43	96	3
Shanghai	..	..	38	..	..	39	..	..	44	..	..	46	..	..	66	..	..	73	..	..	81	..	..	80	..	..	73	..	..	63	..	..	52	..	..	42	..	..
Sitka	..	..	31	..	..	33	..	..	36	..	..	41	..	..	47	..	..	52	..	..	55	..	..	56	..	..	52	..	..	45	..	..	38	..	..	33	..	..
Unalaska	..	..	30	..	..	32	..	..	30	..	..	36	..	..	41	..	..	46	..	..	51	..	..	52	..	..	46	..	..	38	..	..	34	..	..	30	..	..
Yap	..	..	80	..	..	80	..	..	81	..	..	82	..	..	82	..	..	81	..	..	81	..	..	80	..	..	80	..	..	80	..	..	80	..	..	80	..	..
Tokio	..	..	37	..	..	38	..	..	44	..	..	54	..	..	62	..	..	69	..	..	75	..	..	78	..	..	72	..	..	61	..	..	50	..	..	41	97	4

to Tahiti, in the Solomon Islands, a distance of 2200 nautical miles; (3) from Tahiti to Suva, in the Fiji Islands, a distance of 1830 nautical miles; and (4) from Suva to Townsville, also a distance of 1830 nautical miles. The total distance to be covered in such a flight would be 7860 nautical miles. While Easter Islands do not afford very desirable landing facilities, it probably would be possible for a large rigid airship to accomplish this flight without particular difficulty.

The distance from Townsville, Australia, to Cebu, in the Philippines, is 2270 nautical miles, and from Cebu to Hongkong is 910 miles. This makes the total distance, following the air routes outlined from Valparaiso to Hongkong, just over 11,000 nautical miles. It is very possible that with the development of the rigid airship type of the lighter-than-air machines, a route following this general course might be of considerable commercial importance.

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A NAVY YARD IN WAR TIME

By COMMANDER I. I. YATES (C. C.), U. S. Navy

Numerous articles have been published on the expansion of the army and navy during the Great War, but it is believed that details of the increased pressure brought on one naval unit will be of interest, and a brief account is given of the work of the industrial department of the Norfolk Navy Yard during the war.

Prior to April, 1917, the industrial department employed approximately 4000 men and this number could be brought to only approximately 9000 during the war (although 10,000 more could have been profitably employed), due partly to general scarcity of labor and partly to lack of housing accommodations. The latter defect was in the process of correction by the U. S. Housing Corporation when the armistice was signed, the two industrial villages of Craddock and Truxton being then half built; but slight immediate relief was obtained by building labor camps in the navy yard and vicinity. The productivity of the labor that was obtained was increased by lengthening the regular working hours from 8 to 10 a day. Although the working force of the yard was thus increased, the existing supervisory force was actually reduced; several experienced officers were detached and many of the ablest draftsmen, assistant superintendents and highest rated mechanics resigned to take positions in shipbuilding and munition plants, also many employees left to join the army and navy. For the first time at this yard girls were employed to fill clerical positions.

Upon entering the war the United States made all preparations to fight to a finish even if it took several years to win and to that end millions were appropriated to increase the facilities of the yard plant. A fourth dry dock was already in the process of construction, but two more were soon started, a new shipfitters' shop erected, a new power plant, machine shop, foundry, etc., provided for; and this plant extension demanded a great deal of the time

of the manager, public works officer, shop superintendent, and several other members of the industrial department personnel.

During the war the following dockings were made at the yard: Destroyers, 60; battleships, 43; cruisers and gunboats, 24; transports, colliers and N. O. T. S., 35; hospital ships, 4; tugs and mine sweepers, 45; towing targets, 31; barges, dredges and miscellaneous vessels, 86. Submarine chasers and smaller craft were not dry-docked, but were lifted out by the 150-ton floating crane, 167 of the 110-foot chasers being so handled.

The fleet based only 40 miles from the yard during the greater part of the war, and numerous working parties were sent to the fleet from the yard to carry on repairs, alterations and prepare new designs. Among the items so undertaken were the modification of fire control installations on 10 battleships, designs made for alterations in the bridges of several dreadnoughts, designs for paravane installation, etc. Three battleships were fitted out to join the Grand Fleet.

Three German vessels, the *Bulgaria, Rhein* and *Neckar,* had been lying at Baltimore since 1914. When the United States entered the war in 1917, the crews of these ships did as much damage as possible to them before a guard could be sent down to take charge, the damage consisting principally in breaking the main engine cylinders. These vessels were towed to the Norfolk yard, the cylinders repaired by welding, and the ships thoroughly overhauled, two being converted into the transports *Susquehanna* and *Antigone* and the other going to the Shipping Board as a cargo carrier. Many other transports were repaired or altered and a heavy burden was thrown on the drafting room in preparing stability calculations to ascertain the amount of ballast necessary for the converted transports to carry to make them safe at sea. By arrangement with the commander of the Newport News Division of the Naval Transport Force all transports berthing in the Fifth District at berths other than in Baltimore and Newport News were repaired by the employees of the industrial department, a special organization being built up to take care of them. The Transport Service desired to reduce the stay of each transport on this side of the Atlantic to a week or less, and during this period the transport had to discharge cargo and passengers, take on cargo, water, coal and troops; therefore, it was impracticable to bring

them to the yard for repairs. Two officers were detailed with a working gang to board the transports as soon as they arrived at any of the piers down the river—generally at Lamberts Point—to undertake necessary work, and a floating workshop was fitted to assist them. No transport ever missed her convoy due to delay for repairs.

At the beginning of the war armed guards were furnished to all United States merchant ships operating in the war zone, and in addition to quarters for the guard, life rafts and life boats were supplied, guns and magazines installed, lookout stations, voice tubes, telephones, general alarm systems, radio, signal stations, etc., fitted. Dozens of vessels were given these alterations by the Norfolk yard. During the war nearly 200 vessels in the N. O. T. S. were based in this district and on an average four to eight of these were continually under repair by the yard, every effort being made to rush them out. An example of difficult work encountered is given in the *Rondo,* a Dutch vessel taken over by the government; her H. P. cylinder had a bad crack and it would have taken a year to replace the casting which was the most intricate ever seen at the yard. Electric welding was tried with satisfactory results.

As an instance of the importance of quick work, the *Malang* stopped in on her way from Baltimore to France having on board two of the 14-inch naval guns for Admiral Plunkett's battery. An ordinary week's work was accomplished in less than three days in order to rush the guns to the front, her battery being installed and her dynamo replaced during that period.

The impossibility of bringing ships to the yard was encountered with many of the N. O. T. S. vessels as well as the transports, and was augmented in the case of those carrying mines for the North Sea barrage, all of which were sent from this port. The mine-carrying vessels were continually on the move, as during their week's stay in port they were shifted generally to four different berths for mine charges, mine anchors, coal and cargo.

The relative importance or "priority" of work under way was altered as the war situation demanded. In general, vessels being fitted for service in the war zone were given priority and of these the destroyers were first given preference. Several yachts and coast guard cutters were fitted out for service abroad and 10 steam

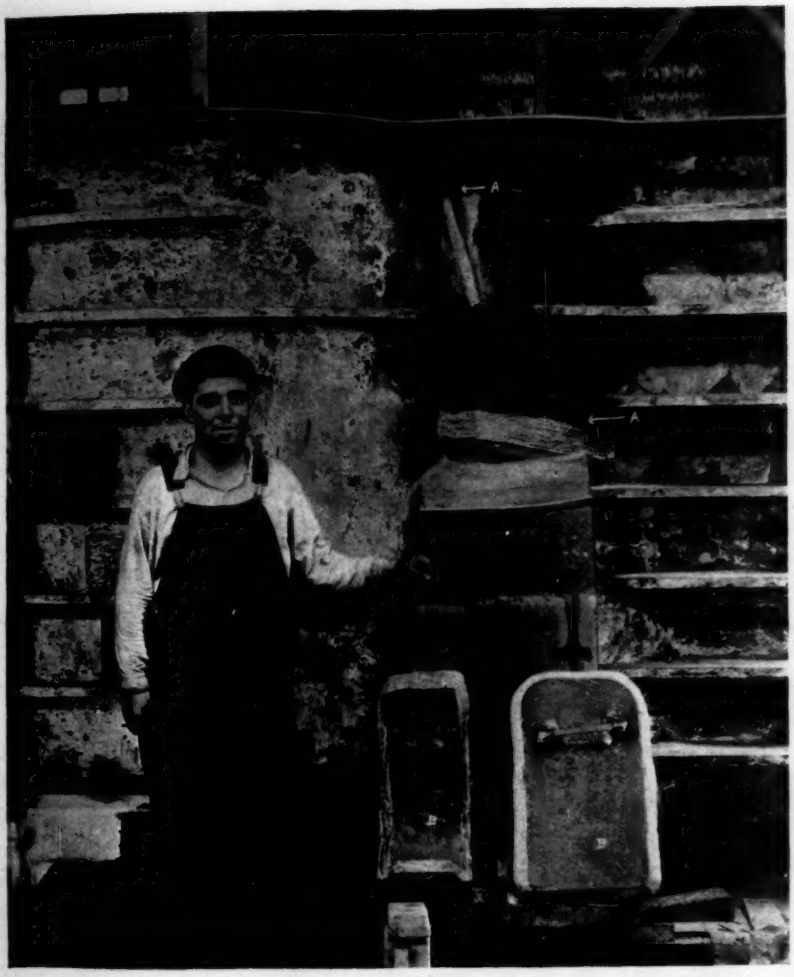
fish boats were equipped for mine sweeping around the British Isles. The yard received over a thousand visits of vessels for repair during the war and so filled its prime function of a repair yard, but coincidently a great deal of manufacturing work was completed, the following items of which may be noted:

1,000,000 gallons paint.
500,000 pounds cement and putty.
200,000 ten-gallon paint drums.
26 launch boilers.
160,000 smokeless powder packing boxes.
420,000 aluminum dishes for crews mess gear.
20,000 hammocks.
20,000 clothes bags.
1,000 target screens.
1,000 coal bags.
700 metal lockers.
2,000 gasoline boat engines.
5 large boilers (in addition to *Craven's*).
986 ships boats.

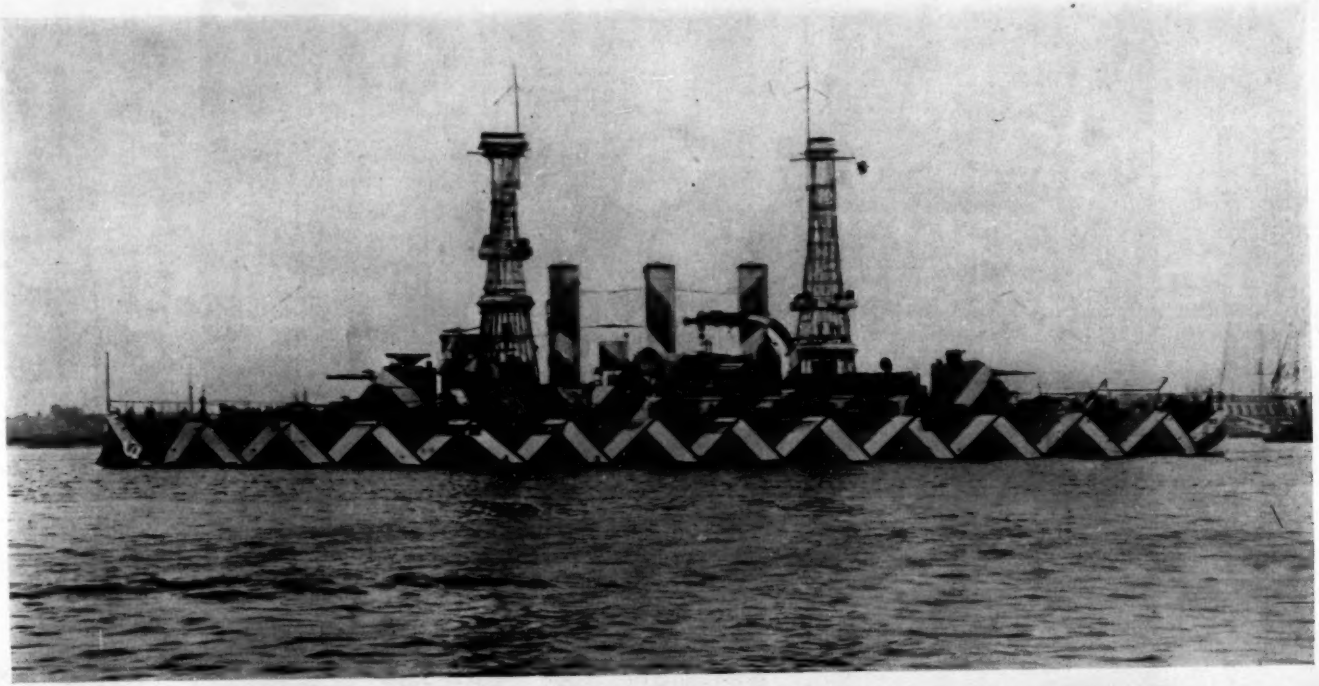
When the influenza epidemic was at its height coffins could not be obtained in the vicinity so the navy yard manufactured 450 ornamental metal lined caskets with their shipping boxes, the first delivery being made three days after the receipt of the order.

To assist the army, anchor bolts and rings for gun emplacements were supplied, 500 tents manufactured, a sunken barge removed from the ship channel, and 10,000 barrels fitted with straps together with 500 steel buoys were supplied for the submarine nets in the channels in Chesapeake Bay.

In combating the submarine and the mine many new devices were perfected during the war and installed on naval vessels. Among them were listening devices, several different forms of which were developed at the New London Experimental Station and installed on destroyers, chasers, mine sweepers and yachts at the yard. As a protection against anchored mines, the Burney gear developed by the English, an underwater kite with a cutter, was installed on all vessels drawing over 12 feet operating in the war zone, 46 such installations being made at the yard. To reduce visibility camouflage painting was employed and all vessels going abroad were camouflaged first from designs invented at the yard and then from standard designs issued by the Bureau of Construction and Repair.



"Rondo" H. P. Cylinder Repaired by Welding.



THE "NEBRASKA" CAMOUFLAGED TO MAKE RANGE FINDING DIFFICULT.

The idea of reducing visibility was soon abandoned and thereafter vessels were painted to distort their appearance and mislead the enemy in judging their speed and course. Another defensive device was the smoke box which was fitted on all cargo vessels, a box of chemicals which when thrown in the water gave forth a dense smoke under cover of which the vessel could escape. An an offensive weapon the Bureau of Ordnance developed the depth charge and many installations of this device with its launching tracks or "Y" guns were made at the yard.

All radio installations in the Fifth Naval District were supervised by the industrial department and more than half of them were completed by the yard personnel; 279 complete installations were made, and radio working parties were sent not only to ships but to stations at Beaufort, N. C., Hog Island, Fisherman's Island, Smith Island, Cape Hatteras, Virginia Beach and Cape Henry.

At the beginning of the war the Norfolk yard was the sole manufacturer of the naval defense mine, and 10,000 Mark IV mines were completed during the war. For the North Sea barrage a larger mine was contracted for by the Bureau of Ordnance and was not made at the yard, but all these mines were loaded at this port and much work was required of the industrial department at Pinners Point to prepare the mine carriers and loading apparatus.

The fleet was kept supplied with targets, screens and gear throughout their target practices during the war, ten 172-foot towing targets being built, and many docked and repaired during that period.

As an example of the war spirit evidenced by the yard may be noted the construction of twenty-one 110-foot submarine chasers. By telegram of April 5, 1917, the Norfolk yard was ordered to build 21 chasers, no preparatory work having been done in advance. The boat shop at that time had but 60 odd employees and these were all engaged on an urgent boat building program. All the wood workers on the civil service employment list were therefore called, to the number of 300, and, of these, very few knew anything about boat building. Requisitions were immediately prepared for the material necessary for construction and every effort was made to expedite delivery, as upon this alone depended the completion date of the chasers. At no time were the chasers given first priority, but at one time the only jobs given precedence over

them were fitting the *Neckar* and *Rhein* as transports and preparing the *Florida* for duty with the Grand Fleet. Eight boats were laid down at once and space was afterwards found for seven more so that 15 were on the ways simultaneously; the first being launched August 16, 1917, first trial September 12, 1917, and commissioned the first week in October. One of the Norfolk chasers won the race from Bermuda to New York on their return from Europe in August, 1919. The chasers built at the Norfolk yard cost less than half the price paid to some of the contractors for similar boats.

The destroyer *Craven* was built complete during the war, although she could not be given priority due to urgent work on transports and vessels going to the war zone. Her boilers, condensers, and turbines were built at the yard in addition to the hull. Her keel was laid November 20, 1917, vessel launched June 29, 1918, and commissioned October 19, 1918.

The armistice in November, 1918, reduced the pressure on the yard to such an extent that working hours were cut from 10 to 8 per day, and practically the only rush jobs that remained were repairs to transports.

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THE FAULTS OF THE PRESENT SCHEME OF PROMOTION IN THE NAVY AND AN ATTEMPT AT SOLVING THE PROBLEM

By Lieut. Commander O. C. Badger, U. S. Navy

Mission

1. To formulate an equitable scheme governing promotions in the navy.

2. To educate officers for, and retain the best officers in, the higher grades of the navy.

Methods Under Discussion at Present

The two general systems of promotion in the navy which are most talked of are (1) Promotion by selection and (2) promotion by seniority. Neither of these plans has, so far, been without grave faults that all recognize, but for lack of a better system, "selection" has come to be the method at present employed.

"Selection," theoretically, is the ideal method of promotion. But there are three principal causes which weaken its equitable practice in the navy, two of which cannot be eliminated and the third only lessened. These may be briefly stated, as follows:

1. Size and wide distribution of the navy.

2. Fallibility of any temporary selection board or assemblage of officers.

3. Varying careers and performances of officers of equal ability or promise, making just comparisons impossible.

These directly result in the following:

(a) Indefinite future and outlook for officers, due to unknown factors which may, some day, enter into their rejection for promotion.

(b) Personality and popularity, while being a necessary military attribute, overshadowing a lack of other necessary attributes,

such as keen mind, initiative, savior and willingness to assume responsibility.

(c) Disgruntled attitude of those men "passed over," yet retained in the service.

(d) "Bootlicking" by men of inferior qualifications, or favoritism, sometimes unintentional, on the part of those higher up.

Under the first classifications above we will discuss the general power of each in regard to this particular question.

1. Size and wide distribution of the navy.

This is a necessary state of affairs, but an enemy just the same, to proper and equitable scheme of promotion by "selection." There is no doubt but that in cases of small plants or concentrated organizations that "selection" forms an excellent basis for promotion. This is the business man's scheme. He employs it to good effect among his salesmen or his shop executives or whatever his expert employees may be, but he has a much simpler job than can be conceived of in the navy. This is because he bases his selection on *direct* competition. In the case of salesmen, for instance, they work for the same end—districts are so distributed among them that their chances may be equal, or else, a scheme of promotion from a poorer to a richer district is maintained, in comparison not with each other's performances, but with results expected and standards set. In many companies, salesmen are given a certain allotment and if they obtain this allotment of sales, they are said to have made an average of 100 per cent. Standings are sent out each month to each salesman and he knows if he is doing well or poorly and his efforts are then controlled by his ambition.

In the navy this is not practicable at present because *we are all working for the same end, but with different tools.* We would as well conduct a competitive target practice between the *Kentucky* and the *Pennsylvania,* without any allowance for size and type of guns and then appoint a board of officers to decide upon the results, or upon hearsay evidence as to which pointers were the best. However, transfer the pointers, ship to ship, and conduct another practice, under the same conditions, and the combined results of the two practices would give direct and just data with which to make comparisons. In the navy we are all shooting at the same target, but we are not a homogeneous force, and naturally our scores are different.

The navy is too large to allow the futures of all to depend on a few officers who may know a few intimately, a few officially, but the largest number not at all, and let them depend on the paper records, which are as different in themselves as the various commanding officers are in their ideas of perfection.

This force (the size of the navy) will defeat itself. It is too big and clumsy to manœuver and the forces of selection are weakened more and more as the size of this force grows larger.

2. Fallibility of any selection board or assemblage of officers.

We think that this is a self-evident fact, that every selection board that meets is liable to mistakes and is liable to work injustice no matter who the selecting officers may be. The strength of this argument has recently been brought out to the service under the new scheme of "electing" officers for promotion. Every officer called upon to name those officers junior to him whom he considers most worthy of promotion has been confronted with this problem. He has been given a list—a typewritten page or more—of those officers eligible, and told to make his recommendations. He knows some of these intimately, perhaps others he knows casually, and all have been surprised at the large percentage that he knows not at all. So it is with a selection board, and the result is that records must be resorted to, to try and do all justice to all concerned. We know of cases of officers who are extremely well known in the service and are extremely popular, who are considered efficient officers in their work, but who would be no more fitted to be promoted than one not so well known or popular, *not because he is not as efficient or of equal or greater promise*, but *because he has not "rounded out his career."*

Take, for example, any popular commanding officer of a destroyer. Assume that he is known as a dashing, virile, capable man, commanding a highly efficient vessel, and compare him with one not so well known outside of his ship, but who has been an efficient gunnery officer and executive of a small battleship. We *cannot* compare them equitably, any selection between the two would be an injustice. One would be more fitted to command a battleship than the other because of his knowledge of material, whereas the other would be superior due to his dash, experience of command, etc. A just choice is impossible.

As it is difficult for a selection board, so it is difficult for the service to select and we must provide a back-ground—something

definite, so that our comparisons may not be haphazard. To do this we must provide requirements and education of these two officers so that there will be no doubt as to who casts the blacker shadow.

It is the likelihood of such temporary selection board to make mistakes that is the cause of "indefinite outlook" for officers. We cannot afford to make such mistakes, for a 2 per cent error affects the morale of the whole. So long as the fallibility of a selection board is acknowledged, this system will be a source of discontent and worry, because there is no trial, the board meets with closed doors, and there is no rebuttal.

3. Varying careers and performances of officers of equal ability or promise, making just comparisons impossible.

This state of affairs is a necessary condition in the navy, under present practice. One man in the navy may have a liking or an aptitude for gunnery, so his inclinations are toward always engaging in a gunnery job. He may consider that his mission is to attain perfection in gunnery, but unless he wishes to continue as a gunnery expert until retired, he forgets his real mission, which would be to so educate himself as to attain all the capabilities which will qualify him in time to become commander-in-chief of the fleet or to command any of its sub-divisions. At the same time, another man may not take a "study" such as "gunnery" for his hobby. He may take a liking to destroyer work and follow this work for many years because he enjoys early command and early responsibility. But this man, too, is forgetting his chief mission and when he reaches the grade of commander, ready for promotion to the grade of captain, he is not fitted for the promotion inasmuch as he is not familiar, or perhaps not even conversant, with modern fleet formations, manœuvers, tactics, organizations, as well as the handling of big guns, powerful engine-room plants and elaborate fire-control schemes. This man would be a detriment to a big ship if ordered to her, as he, who should know more about her than anyone else, in a general and yet conversant way, would be spending his time learning from his subordinates and dependent upon them, rather than letting them benefit by the fruits of his experience.

These two men whom we have cited may be excellent men, they may have all and even more promise than others in their respective grades, but they would not be as capable as commanding officers

of large units, *because they have not been educated up to it.* They have followed their own inclinations and preferences too long and have forgotten the interests of the service and the debt they owe that service. This in spite of the fact that they have worked as hard and with as much devotion to duty as any other man in service.

Thus our present system of *allowing* varying careers is working an injustice, not only to the officers themselves, but to the service efficiency. If we can stop this latitude and state certain requirements which will be necessary for certain promotion from one grade to another, these requirements to be stated specifically and published to the service so that an officer will know that he must have satisfactorily passed all requirements before he can be promoted, our officers will have a more definite, concrete problem to solve.

However, we must make allowance for specialists in any scheme we may evolve, because specialists are often a great advantage to the service and some specialists are necessary.

The foregoing (1), (2) and (3) are the causes of the detrimental effects. They may be likened to the naval policy of a government being the cause of a great navy.

But the actual forces that are at present combatting contentment and efficiency in the service are the direct results of these three main conditions, which it is known we cannot materially change. But we *can* evolve a method of promotion that will eliminate wholly or to a great extent the detrimental results.

It is not the purpose of this paper to dwell too long on the detriments, we are more concerned with a solution, but it will be well to expand slightly on these so-called detriments so that we may decide on the best solution to our problem.

The first

(a) *Indefinite future and outlook for officers, due to unknown or unexpected factors which may, some day, enter into their rejection for promotion.*

This is a result of the present system, and a direct result of condition (2) (above) and affected to a large extent by condition (3). To eliminate this feature of the present system, we should have:

1. Definite goals to attain in order to become eligible for promotion.

2. In case of failure to qualify to *know why.*

This cannot be accomplished by the present system of decisions resting on a few officers whose decisions need no explanation, are made behind closed doors, and may be at fault even in exceptional instances. We must have definite requirements, definitely stated, so that officers may strive to attain them and reach them or fail, as the case may be, knowingly.

Much of the dissatisfaction in connection with the present scheme of promotion is due to this indefinite outlook. It is indefinite in the eyes of many because it is based on:

1. Unequal competition, widely separated, and with different standards and different tools.

2. Being known to the board.

This brings us to the discussion of result

(*b*) *Personality and popularity, while being a necessary military attribute, overshadowing a lack of other necessary attributes, such as keen mind, initiative, savoir and willingness to assume responsibility.*

This feature is detrimental to any scheme of selection, as promotion may rest on "being known to the board" in equally deserving cases. Open decisions, openly arrived at, would prove more effective in upholding the service morale, than allowing a temporary selection board to decide on officers' futures. In order to successfully waive this weakness in the selection method now employed, we would have to appoint a board which personally and officially knows *all* officers in question, which is impossible.

Next to be discussed is fault

(*c*) *Disgruntled attitude of those men "passed over," yet retained in the service.*

Self-respect and self-conceit which are inherent to human nature cause this dissatisfaction. Men are passed over who are not only left in the position of "wondering why," but sometimes the service at large "wonders why" such and such an officer was passed over.

The present system of allowing officers to follow their preferences too much in regard to duty is the father of this difficulty. Were officers made to "qualify" for certain grades by passing satisfactorily certain "requirements," they would definitely comprehend what was necessary for them to become eligible for promotion and would work toward this end. If they failed, they could be definitely shown *where* they failed and with this knowl-

edge would come the realization that in a fair and above-board competition, they had lost, due, not to the policy of the board, or the selection of a few, but to insufficient effort on their own parts. Disgruntlement comes chiefly from expressed sympathy from friends. Lack of such sympathy does not lessen the disappointment perhaps, but does away with the "chip on the shoulder" and replaces it with determined effort to qualify as soon as possible.

The last named of these detriments, effects of the present system of "selection," is

(*d*) *"Bootlicking" by men of inferior qualifications with the converse of favoritism, sometimes unintentional, on the part of those higher up.*

"Bootlicking" is, in general terms, the name of tactics employed in any organization or assemblage where personal favor of others is advantageous. It is not the manner in which a man who stands on his own merits gets ahead, but in all too frequent cases is successfully carried on by men of lesser qualifications.

There is the man who advertises his commendable acts to his superiors, and the man who takes credit for certain results obtained through the efforts of others. Sometimes, and oftentimes, the "bootlicking" is apparent to the senior, and the junior excites disgust, rather than admiration, and this would almost always be the case were the two officers together for a great length of time. But due to the comparatively short cruises together, an officer can often get away with his false advertisement and be separated from his senior before he is found out. This senior carries with him wrong impressions.

This fault, however, is not so prevalent in the service as to be dangerous, but it does exist to a sufficient extent to make the possibility of its future effect on fair selection felt.

The other side of the question, favoritism is even more dangerous. It is human nature to wish for the welfare of our friends. In a voting scheme we are liable to bring this desire to affect our better judgment, where the choice may be between a classmate, or a shipmate, and another. Admirals will stand by a loyal staff, captains to loyal ship's officers, and unintentionally will give them a great deal of latitude in any preference.

We should eliminate this personal element if possible. We should eliminate also political endeavor. Elimination of these

two things would serve only towards establishing a purely just and equitable scheme of promotion, one by which a man must stand on his own merits. We cannot eliminate them under the present scheme of having a selection board or by a scheme of "voting." The fact that a man is "known," or what we have heard about him, is sure to make itself felt in a consideration of one man known and another unknown.

To do away with this effect, we must decrease the latitude of the selection board so that *all* will be equally well known, and all will be equally well represented. This can be done only by the requirement method; that is, requiring that *each man* perform certain work satisfactorily and that each man shall have qualified under well-understood and definite rules for promotion.

By the above reasoning, all the principal detriments to the system of "selection" can be eliminated by establishing a system of promotion on qualification, the qualifications being the satisfactory performance of certain duties *or their equivalents* by every officer in the service. On this basis officers can be compared one with another and in no other way can the system be made equitable and just to all.

Regarding the other principal method of promotion, *viz.*, "promotion by seniority," much has been said in the past few years. It is generally agreed among both laymen and members of the service that this method is wrong because:

1. It does not encourage competition.

2. It gives the laggard the same monetary reward as the ambitious worker.

3. It fills the upper grades with men whose age may have affected their efficiency.

Therefore, we cannot solve our problem by reverting to our former method of "promotion by seniority." However, we must have some method of classification; that is, we must have seniors and juniors in a military organization and any plan of promotion must, between two officers of equal qualification, give the preference to the senior.

A good and efficient officer is not afraid of "selection." He welcomes it, as it means promotion to him. He is willing to show all that he can do better than others and is willing to cast his lot in with theirs on a competitive basis. Any and all efficient and

true naval officers would welcome an *equitable and just* system of selection. But, so far, the service is not satisfied that such system has been evolved. Therefore, in our solution we must state the ideal conditions and then formulate a plan that will attain them or approach them closely.

SOLUTION

From the above general outline of the faults that we have encountered in existing and previous systems of promotion, we should proceed to eliminate these faults and come to our decisions.

The principal defects that we must eliminate are:

(a) Chance of error of temporary selection boards.

(b) Indefinite policy, causing indefinite future for officers.

(c) Effect of "bootlicking" or favoritism.

(d) Disgruntled attitude of men "passed over."

We should make allowance for:

(I) Standardizing careers of officers to provide homogeneous navy.

(II) To recommend policy as to numbers of specialists, either as to type of vessels or as to sciences, commensurate with future requirements of the navy.

(III) To recommend policy to permit promotion of such specialists.

(IV) To see that attribute of personality comes into our factors for promotion by selection.

(V) To make allowance for "selection up," in exceptional and especially deserving cases.

(VI) To make allowance for obtaining the *service opinion* in cases under (V).

Under the principle *defects* that we must eliminate, we have cited

(*a*) *Chance of error of temporary selection boards.*

To leave the subject for a minute, we will outline the apparent good which our General Board has done for the navy. This board has, for years, gone into the matériel and personnel requirements of the navy. It has information at hand on all subjects in this regard. It keeps informed as to the naval policies and potentialities of foreign powers, and after due deliberation advises as to our own requirements. The advice of this board on the subject of ships

required, number, size and types, and as to the armor and armament required is the closest thing to the "last word on the subject" in existence, simply because it has a system, carried out earnestly and without regard to politics or any outside influence whatsoever. It is a board that can and does stand on its own merits and beliefs, and in so doing has done immeasurable good.

We made this board one of great importance, but the duties of this board, in regard to personnel, carry it into the numbers required only. This board advises that we need so many admirals and so many ordinary seamen, etc., but goes into the question no further. It keeps our navy balanced by its efforts. It consistently advises against an overload of one class of vessel. In a few words, it works towards the maintenance of a homogenous navy, well balanced and sufficiently powerful to look out for the best interests of the country.

Thus, if we place such importance in the guiding spirit of a board to act in regard to matériel, why not appoint an exactly similar board with similar duties as regards personnel? Why not appoint a board, composed of high ranking officers, to look after our personnel needs?

Naval power consists of two great forces: personnel and matériel. Why go about the supply of the first in a haphazard way? Just as ships become obsolete before they drop to pieces, so do men. But men can be educated and modernized, whereas few ships can be. A personnel board of equal advisory power as the General Board could do great good.

The establishment, then, of a "personnel board," with broad duties, would largely eliminate the chance of error, because by practically establishing a permanent board we would establish a group of officers whose *sole business* it would be to know all officers due for promotion, a *study* of their past performances, etc.

Therefore, we decide to establish such a board and will proceed with our solution to see if duties could not be imposed on such a board to carry out the requirements stated above.

(*b*) *Indefinite policy, causing indefinite future for officers.*

If such a board were, after due deliberation, to establish certain requirements *or their equivalents* for each grade and state them to the service, we would have a certain definite goal to attain and officers could work definitely toward that end.

Suppose we start with stating the necessary requirements for promotion to the grade of commander, or, if thought practicable, to the grade of lieutenant commander. We state *definitely* that an officer, to be eligible for promotion to the grade of lieutenant commander, must have *satisfactorily* performed certain duties which the board considers necessary for an officer, at this stage of his career, in order that he may be considered a well-rounded officer. We would then have *all* officers arrive at the grade of lieutenant commander, ready to graduate from the watch-standing class, ready to assume responsibility as a head of department or as the commander of a small vessel, with a *definitely* established groundwork. He will have performed duties before he reaches the grade of lieutenant commander which we *know* should have made him a naval officer in every sense of the word.

Then we pass on to the requirements for duties, or their equivalents, which must have been satisfactorily performed to become eligible for further promotion, and so on until we reach the requirements for promotion to the grade of rear admiral.

This plan, fully worked out, would present an ideal condition. It is a condition impossible to attain under our present system. This plan, if fully carried out, would change the officers of the navy from a heterogeneous group, among whom comparisons cannot be justly made, to a homogeneous group, in which *any* man of any particular grade would be fully qualified in all respects to fulfill any and all duties required of that grade.

This state of perfection cannot be reached perhaps, but a proper system, properly carried out, can approach it closely. First of all, we know that in every group in which equal opportunity is afforded, some man will excel. That is due to his superior mind, interest, adaptability or personality. But that is no reason why every man should not be educated properly in a service such as ours. We can lessen the gaps between men greatly if we give them an equal chance, if we *force* on them an equal opportunity, and *force* them to qualify in all respects, and if we forbid them, in their younger days, to follow too much their own likes and preferences.

Therefore, we must state, as some of the duties of the board:

(a) To establish well-defined requirements, or their equivalents, for qualification in each grade.

(b) To study officers' records and see that they are given opportunity to attain those requirements.

(c) To officially note on officers' records why they have not attained certain requirements, and whether it should stand in way of their promotion.

(1) Whether opportunity not offered, due to time.

(2) Whether better employed as a specialist (with the consent of officer concerned).

(3) Whether considered unfitted, for any reason, to fill *any required* position, *at any stage* of his career.

(4) Whether due to sickness (permanent or temporary).

(d) In case of an officer failing to qualify (to satisfactorily perform certain specified duties), to notify him why he failed, and, if possible, give him further and immediate chance to qualify.

We believe that such a board carrying out these duties would do away with the effects of indefinite policies.

(*c*) *Effect of "bootlicking" or favoritism.*

Such a board, working for the good of the navy, under well-defined rules and requirements would certainly lessen these effects, because its recommendations would be the result of *study* of past performances and possibilities, and not be influenced by *general impressions.*

Therefore, we must go on to establish further duties for this board.

(e) To keep all records open and fairly referred to.

(f) To receive all fitness reports.

(g) To standardize fitness reports and *require full reports* at all times. To be able to require any desired information from reporting seniors at any time.

(h) To be free to visit all or any vessels and make reports, on its own observations, as to conditions found, due to personnel.

(*d*) *Disgruntled attitude of men "passed over."*

This brings up "promotion by selection.'

We must make allowance for "selection up" in exceptional and plainly deserving cases. In order to carry this out successfully, as brought out in the first part of this paper, we must eliminate the "personal element" and false impressions. Therefore, if we allow our board, after due deliberation and study of officers' performances, to make *recommendations* for promotion of de-

serving officers, we are making allowance for such "selection up." But we can eliminate the personal element largely by limiting our board to the making of recommendations only, and then once, or twice, a year, having such recommendations submitted *to the service* for vote.

In other words, were a commander through his exceptional ability recommended by the board for promotion over others senior to him, this recommendation would be voted on by all captains and admirals, the result of this vote being final. If it were a captain in question, of course only admirals would vote on the recommendation. In this way we have the approval of the service on such awards due to exceptional ability, and we have no "feeling" of injustice on the part of those "jumped." At the same time, the officer so promoted would be assured of his position as being a deserved one in the eyes of his fellow-officers.

Therefore, to cover this, we must enlarge on the duties of our board, as follows:

(i) To recommend for promotion any qualified officer of the grade of lieutenant commander or above, whose record justifies his being advanced a grade in preference to any officers senior to him and eligible. (In other words, to allow recommendations for "selective promotion" in cases where exceptional record plainly justifies such reward.)

(j) To submit these recommendations to all officers in the service of the rank to be attained by officer recommended, and of all senior ranks. The recommendations to be decided, for or against, by this vote of officers.

Thus, we find that such board can largely eliminate principal defects of present systems of promotion and we proceed to form duties for the board, so that we will make allowance for desirable features in a new scheme:

Taking them as stated:

(*I*) *Standardizing careers of officers to provide homogeneous navy.*

We believe we have taken steps toward the accomplishment of this end in our first stated "duty" of the board, *viz.*, (a) to establish well-defined requirements, or their equivalents, for qualification in each grade.

During the past two years, it has been shown that our present systems of "assignment to duty" have been successful, under the stress of war conditions. The detail office of the Bureau of Navigation is subject to direct compliance with the needs of the navy under the plans of the Office of Naval Operations. If "Operations" states a certain policy, it necessarily changes the policy of the detail office, in order to provide suitable and properly fitted officers to command or officer certain vessels or operations. Therefore, the detail office cannot definitely establish set policies and then carry them out without regard to other influences arising from the changing requirements of the service.

We might state that this *board* should *"make all assignments to duty,"* for then they could *directly* carry out its duties (b) and (d). This, in view of the above, is considered impracticable and it is not in the best interests of the service to take the duties of the detail office from the Bureau of Navigation.

Nevertheless, we must allow our board to "see that officers are given opportunity to attain these requirements." To provide for this we must add to the duties of this board a further duty:

(k) To provide lists of officers to the Bureau of Navigation, these lists to be kept up to date and showing:

(a) Officers in order of seniority in each grade.

(b) Officers fully qualified for promotion.

(c) Officers not fully qualified for promotion and indicating the duties, or their alternatives, which must be performed by each officer to complete requirements.

The addition of this duty might seem to complicate greatly the duties of the detail office, but we must remember that our "requirements," under this proposed system, have been *published to the service* and *each officer* has his own *definite career* to follow out. Therefore, our officers themselves will request such duty as will "round out their careers" and the detail office will not be unnecessarily hampered by the recommendations of the personnel board. We have added duty (k) to the board so that they may assist officers in their "education," but it is more probable that this feature will work automatically and that officers will look out for themselves without such assistance.

Suppose that we have a commander who has never been an executive officer of a large vessel, and that this is a requirement

for his promotion to captain. He will file his application for this duty in the Bureau of Navigation himself. The only difference that this would make over the present system is that this officer would not be indifferent as to "rounding out his career," nor would he request destroyer command, for instance, due to his own preferences, instead of the duty required. In other words, he would be *forced* to educate himself and in doing so would add one more "rounded out" officer to those eligible for promotion to the captain's grade.

(*II*) *To recommend policy as to numbers of specialists, either as to type of vessels or as to sciences, commensurate with future requirements of the navy.*

This is closely allied to (III), so we will take them up together.

(*III*) *To recommend policy to permit promotion of such specialists.*

We can standardize all careers except the careers of those men we term as "specialists." Specialists as to type of vessel may be classed as men who wish to make a life-work in the study, strategy, tactics, handling, maintenance and design of certain vessels, such as (1) aircraft, (2) submarines. As to sciences, we may have specialists in (1) gunnery, (2) engineering.

There are some men who we may decide are desirable or fitted for *permanent work* as such specialists. For instance, a young officer may have been in the submarine force for a long time, and to have expressed the desire to remain in this force. Our board must then establish, commensurate with the importance of such vessels and in relation to the power of the rest of the navy, a definite number of such men in each grade. Also, the board must provide for requirements of such men, that they may make their chosen work their mission in life, but that they will not spend so much time in such "special work" as to lose touch with the rest of the navy, to the extent that they would not even be good commanders of large submarine forces, for the reason that they would not be broad enough to cooperate with other types of vessels.

We are taking a step backwards if we adopt any method tending toward the eventual creation of separate corps. This we have consistently set ourselves against in the navy. The endeavor has been to create the "all round officer" and when one compares our navy with other services, we have cause to congratulate our-

selves on our course. We have had no serious difficulty in finding men from the general service to efficiently perform the special duties in connection with gunnery, navigation, destroyers, submarines, mines, aircraft and last, but not least, engineering, without complicating the service with corps promotion and precedence problems in the line. Our officers are the best all around men in their profession in the world. We can specialize on "designers," but not "manipulators." The former can be kept well in hand because but few are required and they can be handled as we now handle the specialists in engineering, for shore duty only, without interfering with the homogeneity of the line officers. This restriction would not have to be "for shore duty only" in the case of type specialists, such as submarine and aircraft experts, but could, after reaching the grade of commander, restrict them to duties such as shore duty, command of mother ships, and large forces of the type of vessel concerned, and staff duties on the staffs of commanders-in-chiefs. It must be remembered also that we are requiring these men to become educated in surface ships, so as to broaden them in order that they may grasp the necessity for cooperation of forces. It is a question of established requirements again.

Therefore, to take care of this we must impose the following duties on our board:

(l) To adopt a published policy of establishing definite numbers in each grade of "specialists" commensurate with the requirements of the navy.

(m) To establish alternate requirements for specialists, either as to type of vessel or as to sciences.

(n) To keep the navy balanced, as regards line officers, not allowing overload of "specialists."

(IV) To see that attribute of personality comes into our factors of promotion.

In "rounding out the careers" of our officers we take care of this automatically. We believe that with broad duties required in which *satisfactory performance is required,* that sooner or later the man lacking in this essential will be "caught up." A study of results obtained will show such failing.

(V) and (VI) have been covered under (d) Disgruntled attitude, etc.

In line with the above there are other duties that should be assigned this board for the welfare of the service and which may be added:

(o) To recommend that all existing vacancies in higher grades be filled with senior qualified men in grade below, except as under (i) and (j).

(p) To recommend for retirement all officers who have reached certain specified ages in each grade, such as are now existent.

(q) To establish *minimum* time each officer must be in each grade, regardless of qualification, to prevent congestion and crowded application for existing qualifying jobs.

(r) To safeguard the officer and afford him every opportunity, together with necessary advice, as well as safeguarding the interests of the navy.

(s) To submit records and recommendations to the examining board, as required. (The data upon which the examining board will work, will have been prepared in accordance with the approved requirements of the proposed personnel board.)

To conclude our solution, we see that our principal defects are covered and that we have made allowance for desirable features. It must be remembered that this plan starts with the assurance that an officer reaches the grade of lieutenant commander well rounded out, and that to do this we make our first *requirements for promotion* to take effect with this grade. In other words, to become a lieutenant commander, an officer must have performed definite duties, or their equivalents, before he is eligible, these requirements to be sufficiently broad to assure his entering this grade, a full-fledged, rounded-out naval officer, capable of responsibility.

Such system might take period of evolution of four or five years, but any satisfactory system will take time to evolve.

As we think we have fairly covered the situation and have presented an attempt at a solution, we come to our decisions.

DECISIONS

1. To establish a permanent board of high ranking officers to carry out duties (a) to (s) above, and to take the place of the selection board. (Duties (a) to (s) listed on pages 729 to 735 for easier reference.)

2. To establish "selection by elimination," elimination to be made due to well-defined requirements and reasons.

3. To allow the permanent board to *recommend* qualified officers of plainly exceptional ability and record and of the grade of lieutenant commander or above to be advanced to the next higher grade, regardless of seniority.

4. To submit these recommendations to all officers in the service of the rank to be attained by officer recommended, and of all senior ranks. The recommendations to be decided for or against by this vote of officers.

MAJOR DUTY OF BOARD

To provide sufficient well-trained officers in each grade.

ADDITIONAL DUTIES

(a) *To establish well-defined requirements, or their equivalents, for qualification in each grade.*

(b) To study officers' records and see that they are given opportunity to attain those requirements.

(c) To officially note on officers' records why he has not attained certain requirements, and whether it should stand in way of his promotion.

(1) Whether opportunity not offered, due to time.

(2) Whether better employed as a specialist (with the consent of officer concerned).

(3) Whether considered unfitted, for any reason, to fill *any required* position, *at any stage* of his career.

(4) Whether due to sickness (permanent or temporary effect).

(d) In case of an officer failing to qualify (to satisfactorily perform certain specified duties), to notify him why he failed and, if possible, give him further and immediate chance to qualify.

(e) To keep all records open and fairly referred to.

(f) *To receive all fitness reports.*

(g) *To standardize fitness reports and require full reports at all times.* To be able to require any desired information from reporting seniors at any time.

(h) To be free to visit all or any vessels and make reports, on its own observation, as to conditions found, due to personnel.

(i) *To recommend for promotion any qualified officer of the grade of lieutenant commander or above whose record justifies his being advanced a grade in preference to any officers senior to him and eligible.* (In other words, to allow recommendations for "selective promotion" in cases where exceptional record plainly justifies such reward.)

(j) *To submit these recommendations to all officers in the service* of the rank to be attained by officer recommended, and of all senior ranks. The recommendations to be decided, for or against, by this vote of officers.

(k) To provide lists of officers to the Bureau of Navigation, these lists to be kept up to date and showing:

(a) Officers in order of seniority in each grade.

(b) Officers fully qualified for promotion.

(c) Officers not fully qualified for promotion and indicating the duties, or their alternatives, which must be performed by each officer to complete requirements.

(l) To adopt a published policy of establishing definite numbers in each grade of "specialists" commensurate with the requirements of the navy.

(m) To establish alternate requirements for "specialists," either as to type of vessel or as to sciences.

(n) *To keep the navy balanced,* as regards line officers, not allowing overload of "specialists."

(o) To recommend that all existing vacancies in higher grades be filled with senior qualified men in grade below, except as under (i) and (j).

(p) To recommend for retirement all officers who have reached certain specified ages in each grade, such as are now existent.

(q) To establish minimum time each officer must be in each grade, regardless of qualification, to prevent congestion and crowded application for existing qualifying jobs.

(r) To safeguard the officer and afford him every opportunity, together with necessary advice, as well as safeguarding the interests of the navy.

(s) To submit records and recommendations to the examining board, as required. (The data upon which the examining board will work, will have been prepared in accordance with the approved requirements of the proposed personnel board.)

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A SHORT AND SIMPLE METHOD OF FINDING THE LONGITUDE AT SEA

By COMMANDER JOHN P. JACKSON, U. S. Navy

In publishing the explanation of this short and simple method of finding the longitude at sea, no claim is made of originality nor of having discovered anything new. The method has been in existence a number of years. It is simply intended to bring to the attention of the navigators of the navy a short, easy and accurate method which will lighten and simplify their work. This method, although used to some extent in the merchant marine, is, so far as I know, practically unknown in the navy.

It is G. F. Martelli's method for finding the apparent time, and was brought to my attention by the former captain of a merchant ship converted into a naval transport, which I recently commanded.

I have tested the method carefully and exhaustively in comparison with the Marcq Saint-Hilaire method, working innumerable sights by both methods, and have found it absolutely accurate and to be depended upon, the results of the two methods invariably checking to within a mile of each other.

In working longitude sights by the two methods, the advantages of the Martelli method in brevity, simplicity and the lesser likelihood of making mistakes are readily apparent. The entire operation consists in looking up five logs, making two simple additions and looking up the answer in a table. No books other than Martelli's Tables are required, except the Nautical Almanac.

There are five tables essential to the method, bound in a thin book of convenient size of 50 odd pages, which also contains a page of explanation of the method with examples worked out, and additional tables for the correction of the altitudes of the sun and stars. The five tables are arranged consecutively in the order in

which they are used, which tends to prevent mistakes in picking the logs out of wrong tables.

MAIN TABLES

Table I contains the logs to four places of the latitude and declination.

Table II contains numbers expressed in minutes and seconds corresponding to the sum or difference of the latitude and declination.

Table III contains numbers also expressed in minutes and seconds corresponding to the angle of altitude.

Table IV contains auxiliary logs to four places used in the computation.

Table V contains the logs of the hour angle from which the L. A. T. is found.

ADDITIONAL TABLES

Table VI contains the corrections of the apparent altitudes of the sun and stars.

Table VII contains the dip of the horizon for heights of eye up to 100 feet.

Table VIII contains the correction to be added to the observed altitude of the sun's lower limb to find the true altitude.

Table IX contains the correction to be subtracted from the observed altitude of a fixed star to find the true altitude.

The explanation of the method given below is taken directly from the book, and the examples are actual sights worked out in the course of navigating my ship.

EXPLANATION OF THE METHOD.

The data required are the assumed latitude, the corrected declination and the true altitude of a heavenly body. Nothing else is required except the chronometer time of sight, chonometer correction on G. M. T. and the equation of time. From these latter is obtained the G. A. T. in the usual manner.

Put down the assumed latitude and corrected declination and opposite to them their logs taken from Table I.

If the latitude and declination are of the same name, both north or both south, subtract one from the other. If they are of different names, one north and the other south, add them together.

From Table II take out the minutes, seconds and tenths of a second corresponding to the sum or difference of the latitude and declination.

From table III take out the minutes, seconds and tenths of a second corresponding to the true altitude.

Add these last two quantities together. With their sum enter Table IV and take out the auxiliary log.

Add the auxiliary log to the logs of the latitude and declination. With their sum enter Table V and take out the L. A. T.; from the top of the page, if the sight was taken in the forenoon, or from the bottom of the page, if taken in the afternoon.

The longitude is of course obtained by subtracting the L. A. T. from the G. A. T. as in all other methods.

Example 1.—At Sea, September 16, 1919, in latitude 43° 25′ N., at 4.50 p. m., ship's time; the sun's true altitude was 15° 51′ 44″; chronometer time, 6ʰ 10ᵐ 54ˢ; C. C., 49ᵐ 54ˢ. Find the longitude.

	h m s			
C	6 10 54	Lat. = 43° 25′	N.	From Table I, .3612
C. C.	49 54	Dec.	2 50 24 N.	From Table I, .4995
G. M. T.	7 0 48	Dif. = 40° 34′ 36″		From Table II, 15′ 59.6″
Eq. T.	4 57.5	Alt. = 15 51 44		From Table III, 12 6.7
G. A. T.	7 5 45.5			Sum = 28′ 6.3″
				From Table IV, .6475
L. A. T.	4 43 0	From Table V.		1.5082
Long.	2 22 45.5			
	35°41′ 22.5″.			

Example 2.—At sea, September 19, 1919, in latitude 39° 13′ N., at 7.20 a. m., ship's time; the sun's true altitude was 13° 41′ 50″; chronometer time, 9ʰ 31ᵐ 41ˢ; C. C., 50ᵐ 5ˢ. Find the longitude.

	h m s			
C	9 31 41	Lat. = 39° 13′		From Table I, .3892
C. C.	50 5	Dec. = 1 49 10″		From Table I, .4998
G. M. T.	10 21 46	Dif. = 37° 23′ 50″		From Table II, 16′ 34.4″
Eq. T.	5 53.5	Alt. = 13 41 50		From Table III, 12 43.2
G. A. T.	10 27 39.5			Sum = 29′ 17.6″
				From Table IV, .5881
L. A. T.	7 5 2.5	From Table V.		1.4771
Long.	3 22 37			
	50°39′ 15″.			

The principle involved is the same as in all problems of determining the position from the altitude of a heavenly body measured above the horizon; that is, to find a line of position, which is a small arc of the circle of equal altitudes. But the computation employed to arrive at the solution is entirely different from that of the time sight, the Marcq Saint-Hilaire, or the Aquino methods, and is much shorter and simpler.

The columns to be added in one case comprise three figures, and in the other case only two. The logs are only to four places and there are no characteristics. The tables are concise and follow each other in the order in which they are to be used. There are no tedious interpolations to be made. What little interpolation there is to be done is readily accomplished at a glance. Finally, the cumbersome tables of logarithmic functions are done away with, and everything is found in one small thin volume.

This method possesses the same advantage as the Marcq Saint-Hilaire method over the old time sight, of being available at any hour of the day, and can be used near noon to obtain a fix by crossing its line of position with the meridian altitude or exmeridian. The nearness to noon at which it can be employed for this purpose of course depends upon the relative magnitudes of the latitude and declination. If the declination is equal to the latitude, the path of the sun of course follows the prime vertical, and it can theoretically be used to within a few seconds of noon, the sun in this case bearing due east or west and the line of position cutting the meridian altitude at right angles. Naturally the nearer the sun bears North or South, the sharper the angle between the line of position found and the meridian altitude line and a small error in the sight produces a large error in longitude.

For the benefit of those who may be interested in giving this method a trial, the following information is given: Martelli's Tables are contained in a book entitled "Short, Easy, and Improved Method of Finding the Apparent Time at Ship," published by D. M'Gregor & Co., of Glasgow, for four shillings. It can also be obtained from Negus, 140 Water St., New York.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THAT REMINDS ME

By CAPTAIN LYMAN A. COTTEN, U. S. Navy

Of course, we all know that one thing leads to another, and the telling of a good story is apt to be followed by "That reminds me." The fact that the succeeding story bears no possible resemblance to the one that stirs the memory, does not debar it in any way. Thus we wander from story to story and while away many a pleasant hour.

In reading the delightful "Casey Stories" by Captain Cronan in the December PROCEEDINGS, I was reminded of some other service stories. The fact that they are more ancient than those about Casey, and possibly not so amusing, should not debar them, for they in turn may remind others, and thus lead to our further entertainment. I am sorry that I cannot vouch for the authenticity of my stories, and I can only tell them as they were told to me, which I do with apologies to those to whom they come as but the fruit of the chestnut tree, and with the hopes that they may fall upon some new ground and perhaps dispel, if but momentarily, the gloom which now so often envelops us all in these piping days of peace if not of plenty.

TWO LIARS

Private Shea of the marines was stationed at the marine barracks at the New York Navy Yard some years ago, and a sore trial he was to his friends and his officers. For 30 years he had served his country afloat and ashore, but still the only thing he wore upon the sleeve of his coat was service stripes. Many times he had been made a corporal, and once he even survived to become a sergeant, but sooner or later he was sure to look upon the wine when it was red, and great and prolonged was the resulting spree. A

splendid soldier he was between liberties in barracks or on board ship, but the curse of Bacchus was upon him.

Colonel X, in command at the barracks, had known Shea for many years—in fact, since he as a captain had commanded a ship's guard that had Shea for one of its members. He was genuinely fond of him, for despite his weakness he had many admirable qualities, and his long service and unfailing good nature had made something of a corps character out of him. After having kept him in barracks for two months, the colonel noted with regret that again Shea had overstayed his liberty. Five days overtime he had reported in, and his physical condition indicated all too plainly, so his captain reported, how he had spent his time and money on liberty. The patience of the colonel was about exhausted, but almost from force of habit he rang for his orderly and sent an order to the officer-of-the-day for Private Shea to be sent to the office of the commanding officer.

When Shea was ushered in he was clean and neatly shaved and carried himself as erect as though on parade. His pleasant face and gray hair gave him a look almost of distinction.

"I am sorry to see from the morning reports," the Colonel began, "that you have been up to your same old tricks. Five days over leave. What have you to say for yourself?"

Shea for a moment seemed embarassed.

"Colonel," he replied, "may I speak to you, not as a private to colonel, but as man to man?"

"Certainly. Go ahead."

"Well, sir, as you know, I had not been out of barracks for two months. Saturday I had liberty, and went straight to Jersey City to see my wife and children. There I found an awful condition of affairs. My wife in bed sick; no fire in the house; the children crying and unwashed; the window panes broken out; and some of the furniture smashed. I was terribly shocked. I gave my wife my money and started in to put things to rights. I nursed my wife, washed the kids, mended the furniture and even cooked the meals. It was more than mortal man could do, colonel, to come back until my wife was up and about again. By then I was five days over leave."

The colonel without remark turned to his desk and from the top drawer took a letter.

"Shea," he then said, "I will read you a letter that I received from your wife this morning. She says, 'Dear Colonel: Please keep that old drunken renegade Mike Shea in barracks. He let us alone for two months. Then he came in Saturday night drunk and dirty. He took my money from me, beat the children unmercifully, broke up the furniture, and but for the fact that I am a better man than he is, drunk or sober, he would have beat me also. Please see that he can't come home any more and you will have the gratitude of a heartbroken woman.'" As the colonel finished reading he looked up at Shea and asked, "What do you say to that?"

While the colonel was reading a look of the most profound wonder came over Shea's face, and now for a moment he seemed nonplussed.

Then he said, "Colonel, since I am talking as man to man and not as private to colonel, all I have to say is this, the two biggest liars in the marine corps are in this room now. I'm not married."

Shea's captain wondered why the colonel let him off again with only a reprimand.

OBVIOUS

Some years ago a certain man-of-war had one watch in the fire-room composed entirely of negroes. They did very well when properly handled, but one of the engineer officers had a most pronounced faculty for always stroking them the wrong way.

One morning this lieutenant was inspecting the fire-rooms and in one of them he had occasion to reprimand a big negro fireman, ignorant and belligerent. The negro so far lost his temper as to call the lieutenant a d--- fool, for which breach of discipline in the course of time he was called to answer before a general court martial.

One of the witnesses for the prosecution was a negro water-tender who had been present when the occurrence took place. He testified that he heard the accused call the lieutenant a d--- fool as charged, and counsel for the defense took over the witness for cross-questioning.

Q. Are you *sure* that you heard the accused call Lieutenant Z a d--- fool?

A. Yas, sir, I sho heard 'im.

Q. Were they standing close together?

A. No, sir. Dey was some consider'ble distance 'tween 'em.

Q. Were other people present?

A. Yas, sir, some three or fo' of de watch was standin' 'round listenin'.

Q. Then how do you know the accused was referring to Lieutenant Z?

A. (With a look of perplexity.) Well, sir, *he* was de only d-- fool present.

A SEA-GOING APOLOGY

Tom Jenkins was one of the survivors of the old navy. Lacking only a few years of having enough service for retirement (this was before the present fleet reserve was created) he was still only a boatswain mate, second class, though his hair was white and his hand was shaky. A good sailor man, efficient and reliable on board ship, he was a terror on shore on the rare occasion when he went on liberty.

On one occasion in a strange town, Tom, having been ashore for several hours, was sailing well before the wind with everything taut alow and aloft, when he chanced to meet the executive officer of the flagship, who knew him, but whom he did not know. The officer, seeing the condition of affairs and prompted only by the kindest feelings toward the old man, attempted to get Tom to return to the ship before he got into serious trouble. His shore cruise was not to be cut short in any such manner, however, and in the ensuing discussion Tom called the officer "A son of a sea-cook and a meddling sun-downer."

The next day on board his ship when he had sobered up some of his shipmates told him what he had done, and the possible consequences to him, and the old man was very contrite and sought his division officer for advice as to what he had better do.

When his division officer heard the details of Tom's dilemma he told him to go forward and spruce himself up and put on his best suit of blues, and he would arrange for a boat to take him to the flagship where he was to ask for the executive officer and tender him an apology on the quarter-deck. Knowing the executive he felt sure this would stop the matter from going further.

Tom did as directed, and having hauled up to the port gangway of the flagship and come on board he asked to see the executive on the quarter-deck to make him an apology. The executive appeared promptly, whereupon Tom gravely saluted and began:

"They tell me, sir, that last night while in a slightly befuddled condition ashore I called you a son of a sea-cook and a meddling sun-downer."

The executive replied that that was about the substance of the matter.

"Then," Tom continued, "I want to tell you, sir, I don't know whether you are a son of a sea-cook and a meddling sun-downer or not. I've never been shipmates with you."

The apology was accepted in the spirit in which tendered.

THE SWEEPER

The ship was riding to a fitful wind and sweepers had just been piped. The quarter-deck sweeper, a tall and raw-boned youth but recently received from some western farm, went aft and began his sweeping. He would sweep the dust forward for a few yards and then a puff of wind would playfully scatter it behind him again. With patience and forbearance worthy of a better cause he would start back at the after rail, only to have the same thing happen.

The boatswain's mate of the watch in the shade of the after turret watched him as again and again his careful sweeping was brought to naught by the playful antics of the wind from ahead. Finally, striding over to the sweeper as he was preparing to start his sweeping for the dozenth time he said, "See here, my son, haven't you been at sea long enough yet to know that you can't sweep against the will of God."

One *new* one, and some abler raconteur may proceed:

On a battleship during a cruise in the early days of the war, it became necessary to put aboard a newly joined ship the orders and instructions in force. The ship ahead undertook to float them down to the newly joined ship in a water-tight container. The job was being supervised on the quarter-deck by the boatswain, a thorough seaman of the old school, assisted by a number of modern sailors, intelligent and willing, but not particularly well versed in the ways of a sailor, according to the ideas of the boatswain.

The ship astern was in position, the tow-line was bent on to the water-tight container, and the final lashing was being put on.

Wishing to make a neat job of it, the boatswain called for a knife to cut off the ends of the lashing. Not a sailor produced a knife or made a move. In tones of biting sarcasm, that should have been heard to be fully appreciated, the boatswain said with a wave of his hands towards his young sailors, "Will some one kindly cut it with a *wrist watch!*"

ERRATA

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AN IMPROVED TOWING SPAR WHICH CAN BE USED AS A NAVIGATIONAL INSTRUMENT

By Lieut. Commander S. F. Heim, U. S. Navy

TYPOGRAPHICAL ERROR

Page 375, eleventh line, second paragraph, "1 degree of arc" should read "1 minute of arc."

U. S. NAVAL INSTITUTE

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Commander W. S. Turpin, U. S. N.

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ANNAPOLIS, MD., APRIL 15, 1920.

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PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER WALLACE L. LIND, U. S. Navy

GENERAL ARRANGEMENT

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GREAT BRITAIN

CANADA TO RECAST NAVY.—Demobilization of all Canadian naval officers and naval ratings that the service may be recognized "on an economical basis" has been ordered, C. C. Ballantyne, Minister of the Naval Service, announced in the House of Commons to-day. The Naval Service, he said, would be carried along on a pre-war basis. Adoption of a permanent naval policy had been deferred, he explained, pending discussions by the overseas dominions and Great Britain at a forthcoming imperial conference.

Great Britain's offer to present Canada with one light cruiser and two torpedo-boat destroyers to take the place of the *Niobe* and the *Rainbow* has been accepted, he said.—*New York Times*, Mar. 26, 1920.

ANGLO-AMERICAN NAVAL UNITY.—The abiding friendship between the American and British Navies which was so greatly confirmed and strengthened during the war was very much in evidence at the luncheon of the English-Speaking Union on Friday last, at which the First Lord of the Admiralty presided. The occasion was the presentation to the secretary of the union, for him to convey to the United States Navy on his forthcoming visit to America, of a cheque for £6000 from the Dover Patrol Memorial Fund to erect in New York harbor a memorial similar to those which are being placed on Dover cliffs and on Cape Blanc Nez. Mr. Walter Long described America's attitude on 1917 in sending a contribution of destroyers to assist the Dover Patrol as one of splendid loyalty, because it meant that she had to detach those vessels from her own navy and place them under a British Admiral. By doing so she contributed more fully to the ultimate success than by any other act which could possibly have been taken. It is well that this view should be emphasized again and again. The sea affair was all-important to the Allied victory, and it will be disastrous if our policy ever fails to take this fact into full account. The American Ambassador evidently appreciates it, for he declared at the function on Friday that it was the British Navy which, not for the first time, certainly for the third time in recorded history,

threw its decisive weight into the scale against autocracy and despotism; it was the British Navy that saved the cause of freedom, and from Aug. 4, 1914, onwards, made impossible the victory of German arms.—*The Army and Navy Gazette*, Mar. 6, 1920.

IMPERIAL READINESS FOR WAR.—The late war has left the British Empire with heavier responsibilities than before in regard to both Europe and Asia. The political transformation of the European continent and the welter of conflicting forces in Russia have altered the balance of power and the factors which make for peace, while the institution of a League of Nations to ensure peace, with America apparently holding aloof, has actually made European politics more complicated and more unstable than before the war which was to end war. The Peace Treaty, after all the prolonged negotiations connected with it, seems destined to complicate instead of simplifying the European situation. It aimed at creating a number of free and independent States in place of the Central Empires, and removed Poland from Russian control, as one of these, in order to interpose a barrier between Germany and Russia and prevent the former from exploiting the weakness of the latter country in its present divided and disturbed condition. Failing such interposition Germany, by following a policy of peaceful penetration, would gradually obtain control over the commercial, industrial and financial system of Russia and the handling of the products of that country, and thus gain an ascendancy and domination in the East, which would more than compensate for all she lost by the late war. In the end Germany and Russia in alliance, under the militant leadership of Prussia, would be more than a match for a League of Nations, more especially with America left out. In peace Germany would control the minerals, timber, agricultural products, coal mines and oil wells of the whole of Russia and Siberia, she would require to import less food and raw materials by way of the sea than she did before the war and could by tariff or other arrangements purchase those of Russia at her own price and cut off supplies to other countries to any extent she considered advisable. In case of war the Russo-German Alliance would have enormous man-power at its disposal, it would have organized its air-power to fit in with its railway and motor-transport arrangements, and would be working strategically on interior lines, with its lines of communication and sources of supply beyond the reach of sea-power, against a number of scattered opponents. Whether in pursuit of wealth and domination by commercial methods or engaged in war Germany would have the advantage of working under the direction of a ruthless, able and unscrupulous leadership with a definite policy, capable of quick decisions and correspondingly rapid executions, as opposed to a league with admirable ideals, but composed of independent nations, with the possibility of conflicting interests, hesitating policy, and consequently slow decisions and tardy execution of plans.

The resources of Russia, when exploited under German methods of organization, will be a far more potent factor than they were in the days when the country was an empire under the Tzars, and the Russo-German Alliance could bring pressure to bear in Central Asia more easily than Great Britain, sending its forces direct by road and rail while the British troops would have to travel long distances by sea and be brought inland with much greater delay.

As regards Polish interposition between Germany and Russia, the fact is that Poland has been re-constituted from the national point of view, but has not yet had time to establish itself as a Power, and the principle of Polish nationality runs counter to both German and Russian aims and ideas. From the German point of view it is a stumbling block to their policy of obtaining a hold on Russia, and Germany will not rest till such a curb on her ambitions has been removed, while Russia, whether under Bolshevist dominance or any other form of government, would consider

Poland as a dismembered portion of the Muscovite possessions, separated from them without Russian consent by hostile policy or *force majeure*.

Poland may conceivably be able to resist invasion by Germany or re-absorption by Russia, but if both were to assail her simultaneously her fate would be sealed, and her independence and utility as a buffer state would disappear. The Russo-German combination or alliance would then sooner or later come into being with all its possibilities of militant aggression capable of employment either against France or India or those Asiatic states which are since the war under British influence or protection by mandate from the League of Nations, as a corollary of the Peace Treaty.

In the late war the Central Powers and Turkey, under German leadership, might have struck at India had not Russian forces intervened, but in the next war we might find Russia and Turkey combined, under German leadership, against us in Central Asia, and it is difficult to see how the other nations of the League could influence a campaign in that part of the world.

Our position in Asia is therefore in face of these contingencies very different to what it was before the war. In former days our policy towards Turkey as a great Mahomedan Power was a friendly one and we intervened at times to assist her against Russia. We had few responsibilities in any part of Asia beyond India and the countries adjacent, and we made no attempt at exercising influence in Central Asia. Had Russia attempted to invade India, she would have come into conflict with Mahomedan nationalities in the process, and Turkey as a Mahomedan Power, and friendly to the British Empire, might have joined in a religious war against the hated Muscovite and fallen on the flank of the Russian Armies in the line of their advance. But weakened as she is by the war, and with the Turks themselves resentful of our action in freeing Mesopotamia, Palestine and Armenia from Turkish misrule and entering into combined military action with the Arabs against them, she would not only be of little use as an ally against a Russo-German attack on India, but might conceivably be found joining the ranks of our enemies. None of the countries we have liberated from Ottoman control are yet strong enough to afford us much military assistance, and Persia, though friendly, is in the same position and would herself require our protection.

We have, in fact, assumed considerable responsibilities in Central Asia on behalf of humanity and civilization without any corresponding accession of strength. Our action in liberating nationalities from Turkish oppression has been creditable in every sense, and may ultimately be justified politically as it is morally, but in the meantime there is cause for anxiety as to our commitments.—*The Army and Navy Gazette*, Mar. 13, 1920.

THE AMERICAN NAVY.—It is at present no business of ours if the United States decides to embark on a program of warship construction which will give them the largest navy in the world. The legislature will have to do some hard thinking before it commits itself to such an ambition, the cost of which in new ships alone—with a single ship of the *Hood* class absorbing eight millions of pounds—must certainly be stupendous. But if America refuses to come into the League of Nations, and if she does accept what Mr. Daniels regards as the essential alternative, that is, the possession of "incomparably the biggest navy in the world," the fact should not disturb us on this side. It does not at all follow that because the United States, in view of her obligations in two oceans, considers it desirable to build more ships, therefore we must follow suit and compete with her to retain the same margin of superiority which we happen to possess at the moment. Each nation must determine for itself what degree of naval protection it will provide. For many years our own naval strength was based on a two-power standard, but when the United States rose to the position of third naval power it was instinctively felt that this formula had ceased to apply

and that we could not build in competition with our cousins across the Atlantic, a war with whom was unthinkable. Hence, the adoption of the ratio of 60 per cent over the next strongest naval power (Germany). With the removal of the German menace, there is for the time being no regular standard. On what basis out fleet in future will be maintained is a matter which demands earnest thought from the government, and until they have determined upon a policy it is idle to forecast our line of action. There are those, of course, who would have us retain our leading place against all comers. Such people can scarcely have weighed carefully two important considerations, one the identity of the nation against which we should have to build, and secondly the impoverished state of our resources after the most devastating war in history. There is a difference, of course, between shouting for "the largest navy in the world," and getting it in a reasonable time, but if the American fleet is expanded to the size of our own, it ought certainly to make for the stability and peace of the world, for the two English-speaking peoples would then, as Lord Fisher says, be able to compel peace.—*The Army and Navy Gazette*, Mar. 13, 1920.

THE BASIS OF BRITISH MILITARY POLICY.—When peace ensued after the Napoleonic wars the power of England, naval, military, industrial and financial, was so overwhelming that her only rival was the one she had beaten on land and sea. This continued for over 60 years, begetting in our people the idea that our supremacy was to be permanent. Consequently a school of statesmen arose imbued with the idea that as nations grew more and more economically dependent upon one another armaments would decline, and that the particular trade policy of England was a main factor in the preservation of peace. It was but a step in this process of thought to discover that alliances were "entangling." Experience, however, soon proved that the competition in armaments, so far from declining, grew more intense with every decade. Hence the two-power standard in the navy was maintained as the guarantee, if not of peace, of British neutrality. But it was not until Germany challenged this country in 1900 that our isolation ceased to be regarded as desirable. Then a military alliance was negotiated with Japan in order to lighten our burden in the Far East and India. As the German menace in Europe loomed up darker than ever, the British Government of the day fell back on our traditional policy, the balance of power, by the creation of the Entente, which, under the pressure of events, developed into an alliance.

Friendship with France has, therefore, been the basis of our military policy in peace and war for 16 years, and has stood every test. But since the attitude of the United States towards the Peace Treaty and the obligations in Europe, which she voluntarily assumed, there has been no definite declaration by a responsible British statesman as to the basis of our military policy. It is to be our solid friendship with France, predicating the maintenance of the balance of power, or the nebulous League of Nations, predicating internationalism, whose working hitherto has never been favorable to England as a nation or as an empire? If when she was self-supporting as to food, and great and wealthy as no power before her ever was, circumstances compelled her to increase her navy up to the two-power standard in 1869, and if something of her security were lost, she was still easily the first among the nations further to augment her strength by alliances, how much more necessary is a firm foundation for her military policy to-day.

Nevertheless, the school, whose theories have been tried and found wanting to such an extent that the responsibility for our unpreparedness in 1914 can be placed at their door, are as busy as ever. They insist upon our adoption of the League of Nations, as the governing idea of our military policy, and, as most of the "intellectuals" are on their side, carry on a most active and insidious propaganda to influence public opinion. Not that anyone has any objection to the League of Nations as such. Let it

grow and prosper; the sooner the better. But until its value to us as a nation and an empire is proved, surely the wise course for us is to continue those relations with France which have served us so well in the past. This is precisely what the ardent advocates of the League of Nations do not desire. Their argument is that the French alliance is an obstacle to the implementation of the League of Nations. But, as none of their prophecies they made before the war came true, we shall be well advised not to put too much faith in them now. By all means encourage the establishment of the League where possible, but to substitute for a solid means for adding to our security the airy castles in Spain of the League would be highly dangerous. When it comes to a question of defence the interests of France are our interests; of all the nations which took part in the war she has inspired the warmest and most enduring sentiment in British hearts, and naval, military and financial co-operation with her is just as important to us in 1920 as it was in 1914. In short, a military alliance with France is as essential to Britain in peace as it was in the great war.—*The Army and Navy Gazette*, Feb. 21, 1920.

THE WELFARE OF THE NAVY.—There never was a time when more consideration and effort were devoted to matters concerning the welfare of officers and men of the Royal Navy than is the case to-day. It is well that this is so, of course, but it is important not to dismiss the subject at that. If the British Navy is to retain its premier position for valor and efficiency among the fleets of the world, it is not only well but essential that earnest attention should continue to be paid to the conditions under which its personnel are called upon to serve and which so vitally affect their happiness and contentment. The lesson of the late war is plain on this point. The scientific student of men and affairs who is particularly interested in that line of investigation can hardly fail to be struck by the psychological difference between the British seamen of the Grand Fleet and those of Germany. Many historians may be occupied for days on end with their examinations of the events of the struggle, and the material considerations and factors involved, but they will miss the heart of the problem unless they take into account the difference in the human element—the mental and physical condition of the men on either side—which played so large a part in the outcome of the struggle. There is, therefore, no apology needed for the steps taken by the Admiralty since the armistice to develop welfare work in the service; rather must it be a source of satisfaction that their lordships are alive to their opportunities in this direction.

It is not surprising that Lord Beatty, with his unique experience of command in the grand fleet throughout the war, should have a high estimation of the value of welfare work. At the banquet given to him and his brother officers of the fleet at Portsmouth in September last, he said: "In the dark days, when officer and man came closer together, the common danger brought out all that was best in both. It increased that feeling of mutual respect which we must see to it in the future is never allowed to fade." There could be no greater contrast between the spirit of the Grand Fleet at Scapa and the High Seas Fleet in Schillig Roads. That estrangement between officers and men in the enemy ships, patent before the war, was intensified by the condition of idleness imposed during hostilities. The men were callous and full of contempt for their officers; the latter were harsh and overbearing. Captain Persius has said, "The haughty lieutenant, 'whom none can imitate,' is in a large measure blamable for the discontent of the men. . . . . It was only necessary to show a little sympathy to make the men feel that they were of the same flesh and blood as the officers, and they were at once touchingly willing and loyal." Under the stress of defeat the spirit of the German naval personnel was entirely broken, and the result was a revolution which broke up not only the navy, but the empire.

It is beyond the scope of this article to trace the exact causes of, and responsibility for, the German naval decline, but in regard to the future it is well to note the steps which have been taken to apply in our own service the lessons learnt. It was known long before the armistice that a great deal of dissatisfaction existed in the navy both among officers and men. They saw how people in civil life were constantly receiving additions to their incomes in the shape of increased wages or war bonuses, whilst they, absorbed in the business of keeping the enemy at bay, and daily facing hardships and perils in doing so, were compelled to keep going on the low pre-war rates of pay, which were already out of date in 1914. The real trouble lay beyond the service itself. There was no influence strong enough to move Parliament and the government. What the Admiralty and the commander-in-chief could do they did—indeed, as Mr. Lionel Yexley, who writes with authority on these matters, recently declared, in the rising discontent "the only thing that saved the situation, so far as the service afloat was concerned, was the general good feeling existing between officers and men." Thus it came about that towards the close of the war committees were set up in the Grand Fleet and at the ports, on the initiative of the officers, to formulate schemes for improving the men's pay and conditions. On the other hand, when, later on, the report of the committee on officers' pay was delayed, it was the seamen who, through their societies, put forward protests to the authorities, thereby expressing their determination to see justice done to those under whom they served.

The great outcome of this movement was the setting up last year of a permanent Welfare Committee at the Admiralty, of which Admiral Sir Thomas Jerram was appointed President on October 1, 1919. The system, as Dr. Macnamara recently explained in the House, includes a meeting of lower deck representatives at each home port, as a preliminary to the inter-port meetings, and the final meeting of the committee in London. The first of these meetings at the Admiralty, when Admiral Jerram's committee met the 18 elected representatives from the lower deck ratings, began on October 14 last. It has been stated by Chief Writer Lane, the Chairman of the Inter-Port Committee, that a statement consisting of 56 items was drawn up by that body. This has been considered by the Admiralty Committee, whose report is now being presented to the board. The publication of this first welfare report will be awaited with great interest by the navy and the public. It is an experiment which, like the Sports Control Board and similar organizations, should be fraught with much good for the future of the service.—*The Army and Navy Gazette*, Mar. 13, 1920.

EFFECTS OF BRITISH GUNFIRE AT JUTLAND.—It has long been known that the German battle-cruisers were so heavily punished as to be ineffective for at least five months after the battle. A German officer informs us that 20 hits from 15-inch shell and as many more from 13.5-inch and 12-inch were traced on the *Derfflinger* alone. He expresses astonishment that any ship could survive such a battering without going to the bottom. The *Seydlitz*, however, fared still worse. That she ever reached port was something of a miracle, and in view of the photograph which shows her down by the head, and obviously water-logged, the German admission that only the proximity of Wilhelmshaven and the fine weather enabled them to salve this battle-cruiser is somewhat superfluous. Of the other three vessels of Admiral Hipper's squadron, the flagship *Lützow*—a sister ship of the *Derfflinger*—sank in the early hours of June 1, having been, in the German phrase, "shot to pieces"; the *Moltke* had upwards of 20 direct hits, and the *Von der Tann* almost as many. There seems no doubt whatever that the total number of hits registered on the German ships during this encounter was considerably higher than the total received by the British fleet, even if a large percentage be allowed for hits on the *Queen Mary* and other vessels which sank in the battle. So much has been heard of the

excellence of German naval gunnery that this proof of the equal, if not superior, efficacy of our own shooting deserves to be recorded.

In his book on "The Grand Fleet," Lord Jellicoe suggests that the British armor-piercing shell in use at the date of Jutland was inferior to the German type. "With one of the old type of armor-piercing shell of a particular caliber as used at Jutland," he writes, "the shell would, with oblique impact at battle range, *break up whilst holing a certain thickness of plate*, and the shell could not, therefore, reach the vitals of the enemy's ships." Subsequent to the battle a new type of shell was produced and issued to the navy. This improved projectile would, at the same oblique impact and range, *pass whole through a plate of double the thickness* before exploding, and could therefore, with delay action fuse, penetrate to the magazines of a capital ship. Had the navy possessed this new type of armor-piercing shell at Jutland, many of the German ships, Lord Jellicoe believes, instead of being only damaged, would not have contrived to reach port. We have since learned, however, that not all the British shell failed against the German thick armor plate. Attention is directed to the hits on the gun-houses and barbettes of the *Seydlitz*. These structures were built of Krupp cemented armor from 12 inches to 11 inches in thickness. The projectiles passed clean through, and—as Commander von Hase and other witnesses testify—exploded inside with terrible effect. The *Derfflinger* had two of her four 12-inch turrets, which were built up of 12-inch plating, penetrated by heavy shell and completely disabled, a third being damaged by injury to the turntable. On board the *Seydlitz* no less than four out of the five 11-inch turrets were placed *hors de combat*, three being penetrated. Again, the *Lützow*, *Derfflinger*, *Seydlitz*, and *Moltke* were "repeatedly" holed on the water-line, where the armor amidships at any rate was 11 inches to 12 inches thick. These results do not confirm the view that our projectiles were uniformly inferior. Moreover, their large caliber made the burst extraordinarily destructive. In two successive hits from 15-inch shell both after turrets of the *Derfflinger* were disabled, and their crews, including all men in the working chambers, handing rooms, magazines, and shell rooms, were annihilated. The extreme range at which some of the artillery fighting took place is evidenced by the views of deck hits. These, it is clear, were from shell descending at a very steep angle, the effect resembling howitzer fire. We have frequently alluded to the new problems which confront naval constructors in this matter of long-range gunnery, with the corollary result of plunging fire. Stout belt armor is no longer sufficient of itself to protect the vitals of a ship. At a range, say, of 20,000 yards, the danger space may be comparatively small, but the effect of individual hits is likely to be more serious than in the case of flat trajectory fire. The Germans, oddly enough, adhered to very thick deck planking, which, of course, splintered under the impact of a projectile, and thus provided fuel for the conflagration which almost invariably follows a high-explosive burst. It may safely be predicted that in the capital ships of the future horizontal protection will be considered as important as side armor. In fact, the armor distribution in our latest ship, H. M. S. *Hood*, reveals this tendency to a marked degree.

That four of the German battle-cruisers succeeded in regaining harbor after the terrific hammering they received at Jutland is attributable to the elaborate nature of their protection above and below water. But since every warship is a compromise, this abnormal capacity for standing punishment involved the forfeiture of three qualities to which the utmost importance is attached in the British Navy, viz., great gun power, high speed, and habitability. As the German ships were designed for the sole purpose of fighting in the Narrow Seas, their constructors were able minutely to subdivide the internal spaces which otherwise would have been devoted to living quarters; while the weight saved by economizing in the caliber of guns and the power of the machinery and boilers was put into

armor. As coast defence ships or small-radius cruisers the German vessels were no doubt admirable, but as "all-around" fighting ships they were, we think, outclassed by their "opposite numbers" of the British Navy.—*The Engineer*, Feb. 20, 1920.

NOTES ON NAVAL POLICY.—During the past year it has not been possible to frame a definite statement on naval policy owing to the changing situation, the necessity for keeping the fleet prepared for eventualities during the Armistice period, and the active operations imposed on the navy in the Baltic.

It is now possible to estimate more clearly and closely what are the requirements of the future, and to make what it is hoped will be regarded as a fairly full statement of our naval commitments and proposals.

Since sea power is essential for the security and prosperity of the British Empire, it is the object of the Board of Admiralty to proceed on lines which they believe will provide us with our vital requirements, and at the same time secure the exercise of rigid economy. The expenditure necessary for such a policy is merely an insurance for our existence and a guarantee of our increased prosperity.

There has been some criticism of the maintenance in commission of the present types of vessels, especially in regard to the capital ship. A contrary policy has been openly advocated, this policy being based, it is presumed, on the idea that the battleship is dead and that submersible and air vessels are the types of the future. The Naval Staff has examined this question with extreme care, and as a result we profoundly dissent from these views.

In our opinion the capital ship remains the unit on which sea power is built up.

So far from the late war having shown that the capital ship is doomed, it has, on the contrary, proved the necessity for that type. On the German side the whole of the submarine campaign against merchant vessels was built up on the power of the High Sea Fleet. On the British side the enemy submarines in no way interfered with the movements of capital ships in carrying out operations; destroyer screens, new methods of attack, and altered tactical movements defeated the submarine.

Nor at present could the Board of Admiralty subscribe to the statement that aircraft have doomed the capital ship. Aircraft are certainly of the highest importance in naval tactics, as regards reconnaissance, torpedo attacks, and artillery observation, but their rôle in present circumstances is that of an auxiliary and not of a substitute for the capital ship. The past history of this question must be taken into account; many times has the doom of the battleship been pronounced. The introduction of torpedo craft was believed in certain quarters over 20 years ago to have settled his fate. The Board of Admiralty at the time refused to be carried away by the attractiveness of the idea of building small, cheap torpedo craft instead of battleships, and they proved to be right. History has shown that the introduction of a type to destroy the capital ship has been quickly followed by the evolution of counter-measures which sustain its power.

We therefore believe that the battleship must remain the principal unit, and that fleet tactics and tactical training must be carried out with the battle squadron as the main unit. Nevertheless, it must be emphasized that, although the battleship remains, its type may require to be altered. Advances in electricity, in the internal combustion engine, and in science generally will inevitably necessitate an eventual change of type, and it is one of the principal functions of the Naval Staff to keep continuous watch on scientific development with the object of ensuring that the type of capital ship designed meets the requirements of the future. It is even possible that the present battleship will change to one of a semi-submersible type, or

even of a flying type, but such types are visions of the far future, not practical propositions of the moment. By gradual evolution and development the types forcasted may arrive, but the immediate abandonment of the capital ship in favor of a visionary scheme of aircraft and submarines would leave the British nation destitute of sea power and without the means of progressive training.—*The Engineer*, March 19, 1920.

H. M. SUBMARINE "L-33."—The class of submarine to which *L-33* belongs has been shown to be about the most useful and efficient for all-round ocean-going service. She shows several improvements upon preceding ships, one of the most noticeable to an outside observer being the position of her gun, which is placed on a revolving platform on the conning-tower instead of being fitted as in earlier ships on the forward deck, which is too low a place to work a gun easily except in comparatively fair weather. In addition to her gun, *L-33* has a battery of torpedoes which make her a most formidable craft.

She is propelled on the surface by a twin set of internal combustion oil engines. When submerged the ship is driven by powerful electric motors, the current being obtained from storage batteries. In every part of the ship the latest machinery and apparatus known in submarine service have been installed. These are chiefly noticeable in the central control room, which is more spacious than is often found in submarines, and has been admirably planned to ensure the efficient and prompt working of the ship in action and at all times. A gyroscopic compass is installed, connected with several tell-tale cards placed at convenient positions. There are three periscopes of the latest pattern.

The ventilation of the ship has been very carefully studied, air trunks being led through every compartment. Electric fans in connection with these trunks ensure air being kept as fresh as possible in the dynamo and engine rooms, as well as in the torpedo room and in other compartments of the ship where there is accommodation for sleeping and messing.

JAPAN

THE ISLANDS MANDATE.—The news is cabled from Paris that Japan had made a protest against the terms of the mandate given to Australia in connection with the administration of certain Pacific territory formerly in the possession of Germany. The alleged protest is said to be based upon the objection that under the new arrangement Japan enjoys fewer advantages than she had when the islands were a portion of the now-shattered German Empire.

Although no details are yet available regarding the specific disadvantages complained of, the position will be easily understood when it is remembered that in all ex-German territory of which Australia is the mandatory administrator the laws of the commonwealth apply in every particular. Whatever may have been the accepted custom or written law in those places when the Germans were in occupation, the position now is that the identical laws which operate in Sydney, Melbourne and all other parts of the commonwealth operate with precisely the same force and authority in the mandatory territory whose administration has been placed in the Peace Conference in the hands of Australia.

It is not surprising that the change is one which fails to rouse any enthusiasm in Japan, in view of the various restrictions included in Australian law upon Asiatic activity. The subject is a very difficult one, and if it is true that Japan has formally protested against the terms of the mandate, the position will call for firm, but delicate handling. If Japan is to enjoy the same privilege as existed under the German régime, then Austrian law will not and cannot apply to the mandatory territory. And if Australian laws do not apply there with the same force as if the

territory were an integral part of the commonwealth, then the key to the back door of Australia will not be so securely held as it was believed to be.

THE JAPANESE TROOPS IN SIBERIA.—The following are the figures of the losses suffered by the Japanese Siberian Expeditionary Force since it took the field in April, 1918:

Killed	572
Wounded	485
Deaths from sickness	436
Sick	55,257
Total	56,750

The large number of sick is attributed to the unfavorable Siberian climate, the majority of the cases being influenza.

On the 16th instant, it was decided to send the 22d regiment of infantry now at Vladivostok to the front of Transbaikalia. Although kept secret, the object of the movement seems to be to give sufficient support to the Seminoff Army in Transbaikalia in case the circumstances go worse against the Omsk Army, and check the eastward descent of Bolshevist forces on the province, so as to save the region entirely from their menace.—*Osaka Asahi*, Nov. 17, 1919.

REDUCTION OF TERM OF MILITARY SERVICE.—Some time ago the period of compulsory military service was reduced from three to two years for infantry alone. The authorities have now decided to make a similar reduction for all other arms of the service except cavalry. The condition of national education and other things have greatly changed since scores of years ago when the three-year system was established in this country, and in view of the disarmament imposed by the League of Nations, the proposed reduction of the period of service from three to two years is welcome.

There is no reason, however, why cavalry alone should be made to continue to serve for three years. The period of service for this arm should also be reduced to two years.

Under the present system, infantry men are allowed to return home temporarily during their period of service at the harvest time, or for other domestic purposes. It is desirable that this system should be extended so that the men can spend one-half of their period of service in barracks and the other half at home, and that it should be applied also to all other branches of the service.—*Tokyo Asahi*, Nov. 12, 1919.

TWENTY MILLION YEN EXTRA MILITARY EXPENDITURES.—As long as we do not see the withdrawal of the Siberian troops we cannot cut down the expediture for this year. The extra expediture for the year 1919 was estimated to be 180,000,000 yen and it has been paid by public and private loans.

The estimates for 1920 have not yet been decided upon by the Army and Navy Departments, but the opinion now is that while the navy can cut down some of the expeditures the Army Department must increase, or at least not decrease, the 1919 sum (120,000,000). At least 200,000,000 yen is expected to be demanded for next year, or an increase of 20,000,000 yen, last year's total for army and navy being 180,000,000 yen.—*Hochi*, Nov. 11, 1919.

ESTABLISHMENT OF AVIATION DEPARTMENT.—The Army Department, seeing the necessity of controlling both the military and private aviation

enterprises, proposed a draft for the budget for the establishment of an Aviation Department in the Financial Department. The most of this has been recognized by the Cabinet Council, but as the office cannot be completed before April, 1920, and various plans are going to be attempted before that time, the above department will be replaced by an Extraordinary Aviation Committee until the regular department can be opened. At present, Japan has no national or international laws controlling aviation.—*Osaka Asahi*, Nov. 7, 1919.

JAPANESE SHIPPING.—The last five years have been shown a great difference in the position of Japan in the carrying trade of the world. A number of new services were started during the war, and while all the routes have not been maintained since the signing of the armistice, there is evidence of continued activity. No less than ten shipping companies inaugurated coasting and home trade services. A number of new services have been started since the armistice for overseas work. For example, one company owning five ships is to start a service between Siam and South America, and is to carry this year about 1¼ million tons of rice and other cereals to South America. At the present time the tonnage to Europe has been so increased that Japanese steamers have never had greater activity in European waters. The same thing applies to less extent in Australian waters. To cope with this commercial development Japan is making great strides in shipbuilding, which is shown by the following figures. The first six months of 1919 saw 69 vessels of 293,433 gross tons launched, as against 83 vessels of 228,215 gross tons in the first six months of 1918. The decrease in the number of vessels and the increase in the tonnage is accounted for by the fact that the vessels of 3000 tons and upwards launched in the first six months of 1919, total 45, as compared with only 27 in the corresponding period of 1918, the smaller vessels thus numbered 24 and 56 respectively. It is interesting to note that at the end of June, 1919, the Japanese mercantile marine comprised 734 vessels of 2,261,255 gross tons, and excluding vessels of less than 100 gross tons each. Of the 734 vessels 685 were steamers. During the last half of 1919 no less than 71 new ships were launched, having a gross tonnage of 346,079, or an increase of nearly 16 per cent on the total given above. Before the war Japan only built 50,000 tons a year of all sizes. These figures give a good idea how earnestly and diligently the Japanese are working to obtain a prominent position as carriers of the world's merchandise. A comprehensive program has been prepared for the present year, from which we gather that about 103 vessels will be put in hand, having a gross tonnage of 524,125, which indicates a process of steady and marked development.—*The Marine Engineer and Naval Architect*, March, 1920.

OFFICERS LEAVING JAPANESE ARMY AND NAVY.—It is a report that many military and naval flight officers are trying to leave the services out of dissatisfaction at the treatment now accorded them, and that they are endeavoring to find occupations in business companies. This is a serious fact.

Soldiers and sailors should devote themselves to military and naval duties, but they are human after all. Their salaries have been increased by 50 per cent, but this is utterly insufficient to offset the advance in prices, and the increased cost of living must be one of the reasons why they are now trying to change their occupations. Another reason is the prevalence of clannism in the army and navy. It is difficult for those who do not belong to certain privileged clans to attain to important positions.

These two reasons have also caused a great decline in the number of applicants for enrollment in the Military Academy and the Naval Academy. Their number reached the highest point before and after the Russo-Jap-

anese War. In those days youths desiring to enter Military Academy numbered 5000 while those who applied for enrollment in the Naval Academy exceeded 3000. Since that time there has been a remarkable falling off in the number of these applicants. As a matter of fact, the Military Academy could obtain only 110 youths while the prescribed number is 200. Moreover, the best of youths used to go to the Military or the Naval Academy, but the scholarship of the present applicants to those schools is not so good. This irrefutably shows how unpopular the army and the navy have become among the Japanese youths. Flight officers are constantly exposed to danger and the air service is more unpopular than any other arm.

The authorities should accord better treatment to the flight officers if it expects to maintain efficiency in that branch.—*Chugai Shogyo*, Nov. 26, 1919.

JAPANESE NAVAL PROGRESS.—The visit of Rear-Admiral Kato to the British naval establishments is a reminder of the continued progress which is being made by all branches of the service of which he is so distinguished a member. The presence of the Japanese Naval Chief of Staff in England is very gratifying. We cannot forget the warm and steadfast support by the Japanese of the naval efforts of the Allies all through the war, and particularly in the despatch of destroyer flotillas to the Mediterranean at a critical moment in the submarine campaign. That action aroused some criticism in Japan, where certain people objected that it was not required by the terms of the Alliance, but in a speech he made in the *Diet* on July 1, 1917, Admiral Kato, the Minister of Marine, who must not be confused with his namesake now in England, declared that the Government was justified in co-operating with the Allies to bring about the defeat of Germany, and if necessary Japan would send a fleet into the Atlantic. This utterance was typical of the straightforward, progressive and determined policy which has done so much to make the Japanese Fleet the strong and efficient force it is to-day. There is no secrecy in regard to the naval aspirations of the Japanese, nor any wavering in the effort to attain them. The ideal which the naval chiefs have set before them is a fleet of 8 battleships and 8 battle-cruisers, all under eight years of age, and towards this end the construction is now proceeding of 4 new battleships and 2 battle-cruisers. The Minister of Marine also considers that one lesson of the late war was to demonstrate the superiority of the big ship and the big gun, and therefore the new vessels will carry 16-inch, or even bigger weapons. In this way the Japanese show that they are determined to keep abreast of the times. If ever it is brought home to them that the battleship is doomed by the submarine, and that a new type of war hippopotamus is necessary, we may be sure that they will make the change in the same spirit of quiet confidence that they are now pursuing their present policy.—*Army and Navy Gazette*, Mar. 20, 1920.

HIGH WAGES OF JAPANESE SEAMEN.—In the past Japan was able to compete successfully with British ships owing to the low wages with which her officers and sailors were content, but those days are over, and there is small or no indication of their ever returning. It is considered that, if the present high rates of wages are maintained, or even somewhat reduced, 50 per cent of the Japanese shipowners, other than the large companies, are condemned to bankruptcy, and, as any such reduction seems to be out of the question, Japan is undoubtedly faced with a serious labor crisis which, it is believed, will end in a victory for the people and the maintenance of high wages. This will in the course of time lead to the loss of some of their export trade and the failure of small shipping concerns to keep running.—*Shipping*, Mar. 24, 1920.

UNITED STATES

NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION, AS REPORTED MARCH 31, 1920

Type, number and name	Contractor	Per cent of completion			
		Apr. 1, 1920		Mar. 1, 1920	
		Total	On ship	Total	On ship
Battleships					
44 California	Mare Island Navy Yard	91.	86.4	90.5	84.9
45 Colorado	New York S. B. Cpn.	44.7	30.6	43.4	28.3
46 Maryland*	Newport News S. B. & D. D. Co.	69.	64.	66.	59.
47 Washington	New York S. B. Cpn.	43.1	28.2	41.9	26.
48 West Virginia	Newport News S. B. & D. D. Co.	27.	7.4	27.	6.6
49 South Dakota	New York Navy Yard	9.4	7.5	8.1	.8
50 Indiana	New York Navy Yard	9.4	7.5	8.1	.8
51 Montana	Mare Island Navy Yard	7.8	1.	5.9	.7
52 North Carolina	Norfolk Navy Yard	7.8	2.1	6.6	1.3
53 Iowa	Newport News S. B. & D. D. Co.	2.5	....	1.	....
54 Massachusetts	Beth. S. B. Cpn. (Fore River)	....	...	....	....
Battle Cruisers					
1 Lexington	Beth. S. B. Cpn. (Fore River)	.2	....	.1	....
2 Constellation	Newport News S. B. & D. D. Co.	.2	....	.1	....
3 Saratoga	New York S. B. Cpn.	.3	.2	.2	.1
4 Ranger	Newport News S. B. & D. D. Co.	.2	....	.1	....
5 Constitution	Phila. Navy Yard	.2	....	.1	....
6 United States	Phila. Navy Yard	.2	....	.1	...
Scout Cruisers					
4	Todd D. D. & Const. Cpn.	46.3	26.4	42.	21.4
5	Todd D. D. & Const. Cpn.	39.	16.7	35.4	12.5
6	Todd D. D. & Const. Cpn.	29.2	2.6	26.6	2.3
7	Beth. S. B. Cpn. (Fore River)	5.1	2.4	4.4	2.2
8	Beth. S. B. Cpn. (Fore River)	5.1	2.4	4.4	2.2
9	Wm. Cramp & Sons Co.	35.	....	30.	....
10	Wm. Cramp & Sons Co.	30.	....	27.	....
11	Wm. Cramp & Sons Co.	16.	....	14.	....
12	Wm. Cramp & Sons Co.	16.	....	14.	....
13	Wm. Cramp & Sons Co.	16.	....	14.	....
Miscellaneous					
Fuel Ship No. 17, Neches	Boston Navy Yard	64.8	61.3	58.1	54.5
Fuel Ship No. 18, Pecos	Boston Navy Yard	25.8	9.	21.6	7.3
Gunboat No. 21, Asheville	Charleston Navy Yard	99.	98.5	98.4	97.9
Gunboat No. 22, Asheville	Charleston Navy Yard	29.8	24.8	20.7	17.7
Hospital Ship No. 1, Relief	Phila. Navy Yard	77.5	73.5	73.5	69.5
Amm. Ship No. 1, Pyro	Puget Sound Navy Yard	99.4	98.5	99.3	98.2
Amm. Ship No. 2, Nitro	Puget Sound Navy Yard	94.	87.	92.	83.
Rep. Ship No. 1, Medusa	Puget Sound Navy Yard	32.	21.	25.	13.
Destroyer Tender No. 3, Dobbin	Phila. Navy Yard	14.9	12.	13.	9.2
Dest. Tender No. 4, Whitney	Boston Navy Yard	....	....	....	....
Sub. Tender No. 3, Holland	Puget Sound Navy Yard	....	....	....	....

* Launched March 20, 1920.

There are in addition to the above 93 destroyers, 53 submarines, 6 seagoing tugs and 5 oil tankers in various stages of construction.

There were completed and delivered to the Navy Department during the month of March 1 battleship (the *Tennessee*), 6 destroyers, 1 submarine and 1 seagoing tug.

There are 12 destroyers, 7 submarines and 1 transport (*No. 2*) authorized, but not under construction or contract.

NAVAL POLICY

THE FLEET IN 1924.—The Naval Appropriation Bill which was reported to the House of Representatives authorizes the completion of the three years' construction program of 1916. In his annual report of that year Secretary Daniels said that the carrying out of the program would give the navy 27 first-line battleships, 6 battle cruisers and 25 second-line battleships, "completed and in commission" in 1921. It has been necessary to advance the date three years because the war came to halt the construction of capital ships. "As late as October, 1918, explained Mr. Daniels in his last annual report, "we received insistent and urgent recommendations from the representatives of the Allies that the anti-submarine program be accelerated to the limit, in view of existing and anticipated conditions." Accordingly, work was rushed upon destroyers and a considerable number of that type were turned out and commissioned in record time. British officers paid the United States the compliment of saying that the new American destroyers were superior to their own in gun power, seaworthiness and speed.

The armistice having been signed, it was decided to go over the plans for the 12 capital ships of the three years' program and revise them in the light of naval lessons of the war. Admirals Griffin, Taylor and Earle were sent abroad to consult with the British, French and Italian Admiralties in the spring of 1919. In England these officers, who were experts in construction, engineering and ordnance, were invited to inspect the *Hood*, a first-line ship of great speed and heavy battery power, a new type that had made a stir in naval circles. She had been launched, but was not in commission. Upon the return of Admiral Griffin and his associates the General Board heard their report and decided that the battleships should be "completed as expeditiously as possible, and that future designs of battleships should depend upon further development in battleship construction." These vessels, with as little sacrifice of armor protection as possible, are to exceed previous American dreadnoughts in speed and will carry main batteries of 16-inch guns. It was recommended by the General Board that the six battle cruisers authorized should have additional protection to turrets, conning-towers, magazines and communications "at the expense of a small reduction of speed." One lesson of the war was that battle cruisers as constructed by the British before August, 1914, had been built at a costly sacrifice of armor. It seemed better to have less speed and more protection. The United States had fallen behind the times in not adding the battle cruiser type to its fleet, but nothing, fortunately, has been lost by delay. The truth is that the General Board in Admiral Dewey's time thought more of armor than of speed for battleships, and it did not take kindly to the battle cruiser type. That this type if indispensable to a modern navy is a salient lesson of the war.

Chairman Butler of the Naval Appropriations Committee says that "if the building plan authorized in this bill is carried out the United States in 1924 will have a navy equal in strength and value to any navy in the world"—that is to say, equal to the British Navy. The prediction can safely be made if Great Britain adheres to her resolution not to expand her fleet by new construction, because she would not be able to match our 12 new battleships. But there is one division of her navy in which Great Britain will be easily superior unless the United States keeps pace with her, and that is the aviation division. No modern navy can be really formidable and ready to take the offensve at once unless it maintains a strong fleet in the air as well as on the sea.—*New York Times*, Mar. 18, 1920.

SENATORS FOR QUICK NAVY CONSTRUCTION.—Although standing on the 1921 naval building program as authorized by the House, the Senate Naval Affairs Committee will recommend an increase of $39,000,000 over House

appropriations to enable quick construction. The House bill authorized a total of $424,500,000.

The Senate Committee has virtually completed the naval bill and plans to report it to the Senate with liberal increases for other naval enterprises, including an increase of nearly $10,000,000 for naval aviation.

The largest single increase was $11,700,000 for completing aviation tenders under construction at Hog Island, for which material already has been fabricated. The House omitted this item.

To complete 1915 building program as decided on by the House, the Senate Committee raised the appropriations from $48,000,000 to $52,000,000. Items of $11,000,000 for torpedo-boat construction and $45,000,000 for armor plate were left unchanged.

In providing additional funds for naval aviation the Senate Committee increased the House item for naval aircraft from $3,464,000 to $6,500,000 and that for new aviation stations from $1,257,000 to $5,400,000. Funds for experiments and developing all types of aircraft were increased from $2,935,000 to $3,700,000.—*New York Times*, Apr. 8, 1920.

PLANNING NAVY AVIATION ORGANIZATION.—Predicated on the knowledge that since the distribution of the functions of the Division of Naval Aviation among the various bureaus of the Navy Department, the aviation activities of the navy have demonstrated the necessity for an organization having centralized authority, plans are now under consideration in the Navy Department looking toward the attainment of such centralization as will promote aviation in the navy to its fullest possible extent. In the summer of 1919, when the decentralization order went into effect, the director of naval aviation was attached as an aid to operations, and the director's assistants distributed among seven bureaus. In the naval districts the commandant directed schools, stations and depots for aviation, while in the fleets the commander of fleet aviation detachment was an aid to the fleet commander, and each ship commander had under him an aviation detachment. This scattering of the aviation organization has proved cumbersome, and aviation matters necessarily had to travel a long way and by various paths that promoted anything but co-ordination. Secretary Daniels, who has been opposed to the setting up of a separate bureau or division for aviation, is in a receptive attitude for improvement in the Navy Department, it is believed, and the purposes of the study being made with a view to centralization are to devise so complete, time-saving and money-saving an organization that it will warrant the Secretary giving it his very earnest consideration. One scheme approaches the unit idea as exemplified in the U. S. Marine Corps, complete in itself to co-ordinate aviation afloat and ashore, here and abroad. Another plan, which avoids the setting up of a separate bureau, is based on a co-ordinating organization to function under the chief of operations somewhat along the lines followed during the war. Aviation personnel, both in the Navy Department, with the fleets and at the stations, have apparently come to a unanimous conclusion that fleet organization must be established so as to secure a better co-ordination with the bureaus of the Department than is possible with the present decentralized organization, or greater development of fleet aviation will be seriously retarded. The navy authorities on aviation are also making a study of plans for a central organization of purchase and supply for all the government's aviation activities. All these plans and studies will be submitted to the Secretary of the Navy within a few months.—*Army and Navy Journal*, Mar. 20, 1920.

DO WE NEED THE LARGEST NAVY IN THE WORLD?—In his recent testimony before the House Naval Committee, Rear-Admiral Badger urged that our plans for naval construction should be so drawn as to give us by 1925 the largest navy in the world. This means that it will be necessary to increase our material in the way of ships, guns and general equipment fully 50 per

cent. To make such a fleet effective it would be necessary furthermore to acquire some score or so of naval stations all over the world. Therefore the mere first cost of making this enormous material addition to our fleet would, after all, be but the beginning of the financial burdens imposed.

But do we require the largest navy in the world; and if so, when did it become necessary? Before the war, and even after it had been long under way, such patriotic advocates of a strong navy as the Navy League and the National Security League considered that it would be sufficient if our navy held an unchallenged position as the second naval power—and that was in the days when the German Navy was the pacemaker in naval construction and was well recognized as the only outstanding menace to the world's peace.

To-day, with the German Navy absolutely eliminated, the United States Navy has reached its goal Not only is it in the second position, but so powerful has it become that, by the time the three-year program is completed, the United States will be as powerful as the next three great naval powers, Japan, France and Italy combined. In view of this highly satisfactory condition of affairs, the taxpayers of the United States are asking what are the unexpected and seriously menacing new conditions in international affairs which make it necessary for an eminently pacific people, like ourselves, to go on adding to its fighting fleets on a far greater scale than the advocates of preparedness considered necessary, even in the days when the German menace loomed large on the international horizon.

Surely we are doing pretty well in the way of naval construction as it is. We are building no less than 18 capital ships of greater size and power than any to be found among the fleets of other nations. By the time these ships have been completed, having in view the ever-increasing cost of labor and material, they will have made a draft upon our treasury of at least $750,000,000. To the sums appropriated for this purpose the General Board of the navy recommends that we add another big appropriation for building two dreadnoughts, one battle-cruiser, ten scout cruisers, four destroyers, six submarines, besides other smaller craft. This will mean an additional expense of about $250,000,000, or, a total of ships under construction and appropriated for of about one billion dollars.

Meanwhile the world's leading navies are those of our own allies in the late war, with all of whom we are at present, and expect to remain, on the most friendly terms. Consequently, the General Board of the Navy should be prepared to answer the question of the taxpayer when he demands why, in the presence of these favorable international conditions we are to be asked to add this enormous financial burden to those which the nation already carries.—*Scientific American*, Mar. 13, 1920.

ADMIRAL MAYO GIVES CAUSES OF FAILURE TO SUPPORT OUR ALLIES.—In Admiral Mayo's opinion, there are three faults which were the principal causes of our failure to support the Allies more promptly and with greater efficiency. These are indicated in the following summary:

It is my opinion that the material unpreparedness of the vessels in reserve and out of commission, and the shortage of personnel, was due primarily to the national policy of strict neutrality, with its resultant effect of a failure to prepare against war. It should be recalled that Holland and Switzerland remained neutral during the entire war. They were ready to defend their neutrality.

War is the ultimate resource of foreign policy by which the nation seeks to impose its will upon its enemies in defence of its honor, its interests and its existence. The armed forces of the nation are the instruments by which the national policies are supported and enforced.

The strength of the navy to be maintained during peace or mobilized for war is a matter of policy for which the Government (the President and Congress) is responsible. The Navy Department is responsible for advising the government as to the strength of the navy and the extent of the

naval bases and industrial establishments which will be required to enforce our foreign policies.

The Navy Department is responsible for the efficiency of the navy for war so far, and only so far, as efficiency can be attained with the appropriations granted by Congress.

A navy cannot be built and trained in a year or two years, and consequently the foresight necessary to provide for the construction and maintenance of a navy adequate to its future task is of the utmost importance.

Efficient management consists not only in dealing with events as they occur, but in foreseeing and forestalling events. Money expended in building and maintaining a navy larger than required to enforce our foreign policies is extravagance, but the expenditure of less money than required for a navy strong enough to enforce our foreign policies is folly, for failure to make adequate preparation during peace causes the waste of millions when war is eventually forced upon us.

The differences of opinion as to what constitutes an adequate navy can be traced to our lack of a definite foreign policy, about which differences of opinion are the cause of much of the discussion as to naval appropriations which takes place annually before the Congressional naval committees. The remedy for this condition lies outside of the Navy Department, but is vital to the question at issue.

Those responsible for the foreign policy of the United States should definitely inform the War and Navy Departments as to the foreign policies of the United States which the army and navy are to be prepared to enforce. These policies must plan for the future, they must be foresighted, and changes in such policies should be notified to the War and Navy Departments at once.

The future can be foreseen only in proportion as we know the conditions and the laws of nature. As our knowledge of both is imperfect, we can anticipate the future only approximately and for a limited time, but enough can be done to be of the greatest value in preparing the armed forces for the work which they will be required to perform.

Efficient management adopts definite and correct ideals and seeks to obtain them resolutely and courageously. Until the navy is provided with a definite ideal in the form of a definite statement of the foreign policies of the United States which it is to be prepared to enforce, the management of the navy cannot formulate building programs and war plans except on hypotheses as to the foreign policy of the United States.

The next most serious detriment to efficient preparation is the organization of the Navy Department. The laws and regulations under which the navy was operating during the war and is operating to-day are unsatisfactory. Under the present regulations (a) the General Board is charged with devising measures and plans for the effective preparation and maintenance of the fleet for war; (b) the Chief of Naval Operations is responsible for the preparation and readiness of plans for the use of the fleet in war; (c) the General Board is charged with the preparation of plans of campaign; (d) the Chief of Naval Operations is responsible for the operations of the fleet.

The Chief of Naval Operations has no authority to co-ordinate the work of the bureaus whose business it is to supply and maintain the material and personnel. The General Board has no executive functions. Under such regulations co-ordination of the various officers, boards and bureaus can be obtained only by voluntary co-ordination or through the civilian secretary.

So long as the present organization exists the maximum efficiency, either in preparation for war, in the conduct of war or in economical development of the navy in peace, cannot be attained. In the present organization responsibility for the readiness of the navy for war cannot be placed anywhere but with the Secretary of the Navy, who, under the present organization, must co-ordinate thirteen offices, boards and bureaus.

Every dollar spent on the navy should be spent with a view to the accomplishment of a definite plan of preparation for war. The navy is built for war and unless the Chief of Naval Operations, under the Secretary of the Navy, is held responsible for the preparation, readiness, completeness and effectiveness of plans for national defence, including plans for the development of the navy, plans for its maintenance and plans for its use, and is given power, under the Secretary of the Navy, to exercise supervision through the bureaus, boards and offices over all naval activities, the maximum efficiency cannot be attained.

In my opinion, the faulty organization of the Navy Department and the absence of definite foreign policy, except that of strict neutrality, were the primary causes of failure to prepare the entire navy for war.

After the policies and plans were definitely settled upon, after money was appropriated and after the bureaus voluntarily co-ordinated with the Chief of Naval Operations, the work was pushed with energy and vigor. The accomplishments were excellent. But our delay in preparation did no doubt delay our assistance to the Allies at a critical time, and if such conditions regarding our perparation for war exist in the future they may result in disaster.—*Army and Navy Journal,* Apr. 3, 1920.

PERSONNEL

DETACHMENT OF NAVY OFFICERS FROM SHORE DUTY.—The Secretary of the Navy, following out his policy of rotation for officers on shore duty, recently issued instructions to chiefs of bureaus, commandants of districts, yards and shore stations, for the detachment of officers who had been on duty at the same shore station for three years or more. The transfers will be confined to the staff corps, almost wholly. Orders recently issued indicate that the Secretary's instructions are being carried out, though the interest of the commissioned personnel is naturally concentrated on the detachments which will result in the Navy Department. Although there is no denial that rotation of officers of the line is for the best interests of the service, many navy officers are in doubt whether the same rule results in efficiency in the staff corps. Against any plan which would settle an inefficient officer in a soft berth and keep him there official opposition is united. On the other hand, opinion is quite general that when an officer has by his work and interest demonstrated that he is peculiarly fitted for a certain post of duty that officer should be retained so long as he maintains his efficiency. Shifting of officers who are expert in specialized work, it is declared, is as unsound a policy for the navy as it would be for any large civilian concern. Big business keeps its trained specialists where their training aids the efficiency of the whole establishment, and navy officers are of the opinion that the success of our great commercial enterprises points at least to this lesson of getting the best men for work requiring especial fitness and keeping these men where their work will contribute most to the general advance. Rearrangement of staff corps personnel, these officers say, should come as experience proves the worth of each officer for the duty to which he is assigned, and not by wholesale in order to carry out a certain rule.—*Army and Navy Journal,* Mar. 13, 1920.

NAVAL RESERVES FOR MIDSHIPMEN'S CRUISE.—The Navy Department has approved a plan for a four months' cruise this summer for midshipmen of the Naval Academy in ships largely manned by enlisted members of the Naval Reserve Force. It is hoped that many reservists will volunteer for this service. The cruise will prove extremely attractive, as it will take in the Panama Canal, the Pacific coast and Hawaii. There are to be four ships and at least 1500 reservists will be allowed to make the cruise. The question of allowing reserve officers to volunteer has not yet been decided. Full plans are expected to mature this week and orders will follow shortly thereafter for the men who volunteer to report at Philadelphia on May 10.

All reservists who desire to do so can extend their time one year in order to take part in this four months cruise. Commandants of naval districts have been requested to give publicity to the cruise, and to receive requests and applications from naval reservists now on inactive duty desiring to participate. An exact complement to be furnished by each naval district will be designated by the Navy Department.—*Army and Navy Journal*, Apr. 3, 1920.

NAVY LOSING 1000 TRAINED MEN A MONTH.—One side of the delay in Congress on granting adequate pay in the services through the medium of the bills providing increases in pay as it affects the enlisted personnel, and which has been referred to in House debate, but apparently without making an impression, is the loss by the U. S. Navy of approximately 1000 of its trained men every month. These are the four-year men whose enlistments are expiring during this year, and it is estimated at the Navy Department that 20,000 of these four-year men will be lost to the navy in the calendar year 1920 because they are refusing to sign over in the face of the unstable promises of increased pay. It is stated as a fact that unless this movement of men is checked immediately nothing can prevent the greater portion of the navy afloat from being tied up at navy yards and stations by July 1. There are approximately 101,000 enlisted men now enrolled in the regular navy, of which practically 60 per cent is represented by new enlistments. The navy, therefore, is experiencing the greatest difficulty in attempting to fill the places vacated by the trained men who are going out at the rate of more than 200 each week. And the handicap is constantly growing because of the lack of men to train the recruits. Officers are striving to induce the experienced men to remain in the service, but it is a hopeless task for the reason that nothing can be promised to offset the argument that Congress does not intend to grant increased pay, as the men seem to be convinced.—*Army and Navy Journal*, Mar. 13, 1920.

MATÉRIEL

NAVY TORPEDOPLANE UNDER TEST.—Test flights conducted at Philadelphia with the *R-6* navy torpedoplane have proved successful. Lieut. E. W. Rounds piloted the machine, adjusting its balance in the air and trying out the strength of the pontoon system by making landings with the torpedo in position. The increased length of the pontoon, it is stated, indicated that satisfactory stability on the water had been obtained. Lieut. Rounds and Lieut. W. G. Brown recently completed experiments at Hampton Roads in which recording instruments were carried to determine the rate of extension of longitudinal oscillation. Two *F-5* boats were tried with fixed controls. About ten oscillations were distinguishable resulting from an initial disturbance.—*Army and Navy Journal*, Mar. 13, 1930.

U. S. NAVY HAS 75 OBSOLETE WARSHIPS.—The Navy Department has taken steps to secure authorization through legislation from Congress for the disposal of about 75 obsolete warships. These include cruisers, destroyers and torpedo-boats built prior to 1900, and which are of no military value.—*Army and Navy Journal*, Mar. 13, 1920.

ANTI-SUBMARINE BOMBS TESTED.—New types of anti-submarine bombs were tested by army aerial forces at the Army Ordnance Proving Grounds at Aberdeen, Md. The Navy Department Bureau of Ordnance developed the bombs which weigh up to a quarter of a ton. The tests proved very satisfactory to the navy, great amount of damage being done by the bombs, which responded to varied tests with fine results.—*The Naval Monthly*, April, 1920.

OUR NEW NAVAL ORDNANCE PLANT.—It was in 1916 that Congress appropriated $11,000,000 to build a plant for the manufacture of armor for ships of the navy, and the next year $2,080,956 was appropriated for a

projectile plant. Work was started August 30, 1917, on a site of 207 acres at South Charleston, West Virginia. Excellent progress is being made, and the navy will soon be in possession of what will probably be the most up-to-date plant of its kind in existence. The open hearth building is 516 x 225 feet, in which armor-plate ingots of a size up to 200 tons will be handled. The forge and furnace building is 604 x 477 feet, and it has two large wings containing furnaces, with the press between these wings. The armor ingots are forged on a 14,000-ton press, on which gun ingots are hollow forged into lengths up to 93 feet. The heat-treatment building is 320 x 112 feet, and 176 feet in height. The machine shop building is 552 x 320 feet. The plant will be in a position to manufacture armor plate up to 20 inches in thickness, and guns and shells up to 20 inches caliber.—*Scientific American*, Mar. 20, 1920.

FIVE GERMAN WARSHIPS TO COME TO UNITED STATES.—The Navy Department has decided to bring the German battleship *Ostfriesland*, the light cruiser *Frankfurt* and three destroyers allocated to the United States to this country. The U. S. Navy transport *Huncock*, now at New York Navy Yard, will be put in commission with a crew of 260 men to take the personnel and stores for the ships to Rosyth, England, where the German craft will be delivered; 390 men will go to man the *Ostfriesland*, the only one of the five vessels in condition to move under her own power. Twelve men will be put aboard the *Frankfurt* and eight aboard each of the destroyers, as towing crews. The mine sweepers *Falcon*, *Rail* and *Redwing* will each tow a destroyer and the *Hancock* will probably tow the light cruiser. It is thought likely that the battleship will be used as a target for testing navy shells, and that the light cruiser and destroyers, after serving for the study of navy experts, will be broken up. The Navy Department plans to use the *Hancock* as a relief ship for the transports *Newport News* and *Pensacola*, which have long been in the Pacific transport service and are in need of repair.—*Army and Navy Journal*, Mar. 20, 1920.

SECRETARY URGES $140,000,000 MORE FOR NAVY.—Secretary of the Navy Daniels sent request to the Senate Committee on Naval Affairs to increase the naval appropriations as passed by the House by approximately $140,000,000. This increase, he said, is absolutely necessary in order that the Navy Department may successfully carry on its work for the next year and also maintain its program of preparedness. The Secretary asks that the committee restore to the bill the proposal for constructing a drydock and repair shop on San Francisco Bay. The appropriation required for this purpose is placed at $10,000,000 by the Secretary. For the conversion of two merchant vessels into aircraft tenders $700,000 is requested. Mr. Daniels also emphasized the importance of naval aviation and submitted an increase of approximately $9,000,000 for aviation, which will bring the sum to $25,531,000. Increases are also sought for the several bureaus and for a number of the naval stations, especially Great Lakes, Newport and Hampton Roads. Secretary Daniels appeared before the committee in executive session April 1 with Senator Page presiding. Mr. Daniels laid before the committee his reasons for the increase to the appropriation bill stating that the House had made an enormous reduction to the original proposals.—*Army and Navy Journal*, April 3, 1920.

OLD U. S. DESTROYERS TO BE SCRAPPED.—Thirteen torpedo-boat destroyers of old types were sold in Philadelphia recently for scrapping. The vessels included the *Stewart*, *Hull*, *Lawrence*, *Paul Jones*, *Berry*, *Preble*, *Truxton*, *Bainbridge*, *Barry*, *Dale*, *Decatur*, *Worden* and *Whipple*. All were in active service before and during the war. The *Decatur* won two service chevrons. A private firm purchased the entire group for several hundred thousand dollars and will transfer them to Bridesburg, Pa., on the Delaware River, where they will be dismantled.—*The Naval Monthly*, April, 1920.

NAVY WANTS LARGER CRANE SHIP.—Secretary Daniels, of the Navy Department, has asked Congress for permission to spend $2,100,000 out of the naval appropriations for the fiscal year 1921 to convert a battleship into a crane and salvage ship. If this is allowed, the result will probably be the acquisition by the navy of the largest hoisting ship in this country.

It will be utilized to lift the turrets and other parts to the battleships constructed for the American Navy and will be capable of taking at least 225 tons on one trip with a capacity for handling increased weights as they develop under the battleship designs of the future. It has been explained by the naval authorities, who want to use the *Kentucky* or the *Kearsarge* for the conversion, that any one shipbuilder cannot afford to invest in the type of hoisting vessel needed. The construction of large capital ships involves hoisting into a ship at one operation heavy weights which even now cannot be reduced below 165 tons without too much undesirable stripping.

The facilities for hoisting such weights are needed only a short time as compared with the total time that such a vessel is under construction. The number of such vessels building at the same time in private shipyards is so very limited that hoisting cranes of such capacity have not been installed.

In view of the fact that it is not necessary for every navy yard to have its crane for lifting these extremely heavy weights, the navy wishes to have a floating hoisting crane which can be sent from point to point under its own power as the occasion demands. Private shipyards would have the benefit of the crane when battleships were under construction.

The contracts for battleships now under construction provide for furnishing to the contractors such hoisting facilities as the Navy Department may have available, and these facilities will be equally necessary for similar ships at the navy yards. If the Navy Department is to provide hoisting facilities of the required capacity, it is essential that provision be made in the pending appropriations.

The proposed crane ship would also be very useful in transporting assembled turret structures, guns, batteries, and large machinery weights from yard to yard, as well as transporting guns and mounts from the Washington Gun Factory and Indianhead to the building and repair yards. The crane ship could also be used for salvage purposes. A self-propelled crane ship of 250 tons capacity, similar to that herein contemplated, has been built and is now in the service of the British Navy.

The Bureaus of Construction and Repair and Steam Engineering have consulted with crane manufacturers and given consideration to the design of such a vessel, not only with the view of constructing a crane ship complete but also of converting one of the obsolescent vessels of the navy for the purpose.

From this latest consideration it appears that for a complete crane ship $3,500,000 should be allowed. It appears practicable, however, to convert either the battleship *Kearsarge* or the *Kentucky* for this purpose by removing one stack and four of the boilers, removing the superstructure above the main deck, fitting the necessary foundations for the crane, and sponsoning and ballasting the vessel to obtain the necessary stability. It is estimated that the cost of this conversion, including the construction and erection of the crane, will be $2,100,000, a saving of $1,400,000 as compared with the cost of a new vessel.—*United States Bulletin*, Mar. 22, 1920.

AMMUNITION SHIPS TO BE COMMISSIONED IN SUMMER.—The ammunition ships *Nitro* and *Pyro*, under construction at the Puget Sound navy yard, will go in commission about July 1, according to present plans. Equipment to be installed in the vessels held the ships back somewhat until the alterations had been made. The ships are the first of this type to be built for the navy.—*The Naval Monthly*, April, 1920.

NAVY DEPARTMENT SELLS 150 VESSELS.—Upon request of the Senate, Secretary Daniels furnished a summary of vessels disposed of by the Navy Department. The statement made by the Secretary was to the effect that more than 150 vessels of all classes, the largest of which was the *Cambridge* of 3000 tons displacement, had been sold by the Department without restriction as to their future registry under the American flag. Advice of law officers of the Navy Department was to the effect that the law relative to prohibiting registry transfer does not apply to vessels under control of the Navy Department during the war.—*The Naval Monthly*, April, 1920.

VOTES NAVAL BASE FOR PACIFIC FLEET.—The Senate Naval Committee voted to-day to establish an extensive deep-water naval base on San Francisco Bay and authorized the appointment of a naval commission to decide on a site and to submit plans and recommendations by Oct. 1.

The committee voted to appropriate $1,000,000 for the preliminary work of the commission, which will be instructed to confine its selection of a site to one of two locations, Hunters Point, on the San Francisco side of the bay, and Alameda. The ultimate cost of the proposed base has been estimated at from $40,000,000 to $75,000,000.

The proposed base would replace the Mare Island Navy Yard as a docking point for capital ships. The Mare Island Yard would be used in the future, Secretary Danials said, as a construction yard and a repair depot for smaller vessels.—*New York Times*, Apr. 7, 1920.

OPERATIONS

JOINT MANEUVERS, ATLANTIC AND PACIFIC FLEETS.—Joint maneuvers of the United States Atlantic and Pacific fleets have been decided upon, to be held in Panama Bay early in January, 1921. The decision was arrived at on March 15 at a conference of Admirals Wilson and Rodman and Secretary Daniels. The two fleets will assemble shortly after the New Year for drills, exercises and various inter-fleet competitions. The respective dispositions of the Atlantic and Pacific fleets and the itineraries and schedules under which they will work will shortly be prepared by the commanders-in-chief of the fleets, it was stated at the Navy Department. The joint-maneuver plan follows out the long-sought opportunity of Secretary Daniels for essential, tactical and battle exercises, and healthy competition. After the drills are ended the combined fleet will visit the principal Pacific coast ports of the United States so as to give the people there an opportunity to see the ships, and to give the officers and men shore leave.—*Army and Navy Journal*, Mar. 20, 1920.

MIDSHIPMEN'S CRUISE TO PACIFIC OCEAN.—At a conference March 16, when Secretary Daniels met with Admiral Henry B. Wilson, commander-in-chief Atlantic fleet, Admiral Hugh Rodman, commander-in-chief Pacific fleet, Admiral Robert E. Coontz, chief of Naval Operations, and Rear Admiral Thomas Washington, chief Bureau of Navigation, it was decided that the practice cruise for the midshipmen would embrace a trip to the Pacific Ocean the coming summer. Under the immediate command of Vice-Admiral Hilary P. Jones, with the U. S. S. *Connecticut* as flagship, the practice squadron will be composed of the U. S. S. *Kansas, Michigan, South Carolina, Minnesota* and *New Hampshire*. The proposed itinerary will take in Guantanamo Bay, Cuba, Panama Canal Zone, Hawaiian Islands, Puget Sound, San Francisco, San Pedro and San Diego, California. The cruise is to begin June 5 and end August 28, and it is expected that 1500 midshipmen will be quartered aboard the ships. The exact details of the cruise will be prepared by Vice Admiral Jones after consultation with Rear Admiral Archibald H. Scales, superintendent of the U. S. Naval Academy.—*Army and Navy Journal*, Mar. 20, 1920.

MERCHANT MARINE

THE LOAD LINE BILL.—Government regulation of the freeboard of seagoing vessels is a necessity due to the fact that because of the human element in our shipmasters there are many times when vessels will be loaded too deeply.

For many years there has been no fixed position at which a vessel should ride in the water, the result being that many vessels have been lost due to overloading. The lives of the crew have been endangered and in some cases they have refused to take vessels to sea when it was apparent to any seagoing man that the vessel was too deep in the water.

Some years ago this condition was realized in Great Britain and a law was passed requiring a certain amount of height above the surface of the water to a fixed point on the side of the vessel. This height was fixed arbitrarily and depended upon the structure of the vessel. As all ship designers know, there must be a certain amount of "reserve buoyancy" in order to enable the vessel to rise to a heavy sea rather than plunge into it and stand a chance of carrying away deck erections and becoming swamped. It is for this reason that "sheer" has been given to vessels in the past in order to give a sufficient height to the bow to withstand high seas. This curvature of the deck toward the bow also tended to give a graceful appearance to the ship, but that was secondary.

For all seagoing vessels in the American Merchant Marine there should be a definite position at which the ship should float in the water, and in spite of the desires of an avaricious owner who will, in the safety of his own office, load his ship to a dangerous depth, the safety and lives of the crew should be protected.

Whether this law should apply to wooden coasting schooners which often carry a heavy deck load and can be seen during the summer months running along our shores with their decks almost awash, is a question for discussion; but for deep-sea vessels there should be no argument whatever about this important item.

The opposition which developed at a recent hearing is not surprising as a great deal of our tonnage is coastwise, but when the United States lays plans and is forging ahead to become a seafaring nation, sending vessels to all parts of the earth, it certainly should protect the interests of its citizens whether they are sailormen or landsmen.—*Shipping*, Mar. 17, 1920.

A NEED FOR DRY DOCKS.—While the shipbuilding industry of America has grown rapidly during the last few months, provisions for keeping it in trim have not progressed as fast as they should in order to have a well-rounded equipment. Much time is required in preparing such docks as are needed for the average merchantman of to-day. Many years ago the only dock thought of by the average person was one cut out of the solid earth, fitted with gates and into which a vessel could be floated and later the water pumped out. This type of dock is expensive, requires a long time to repair, and in some parts of our coastline would not be suitable due to the formation of the ground.

With the "floating docks," whereby it is possible to sink steel caissons, float a vessel directly over them and then pump out the caisson, thus lifting the ship above it out of the water as it rises due to its own buoyancy, the question of dockage for vessels so that their under-water body may be cleaned and repaired has become comparatively simple. At the present time there are about one-half as many facilities for docking a vessel as there should be and some of the largest ports on the waterfronts of the United States are without sufficient means for repairing vessels which come to their port.

New construction in the shipyards will always be more or less of an erratic business but ship repairing, like housekeeping, is never ending. A ship deteriorates while in service but at the same time she deteriorates at a faster rate when out of service. A ship often becomes foul with

marine growth while in warm waters and it is buffeted about and strained in many of its joints when it is plying the stormy waters of the northern seas. Ships have as many ills as a man and require as much doctoring.

The recent record made by one of the large dry dock companies when lifting a vessel of considerable size shows what can be accomplished when using the right kind of equipment and it is to be hoped that serious efforts will be made to place this part of our marine work on a par with the best equipment in use by other countries who are competing with us for shipping business.—*Shipping*, Mar. 10, 1920.

WAR WORK OF THE MERCHANT MARINE.—A proud war record is credited to the International Mercantile Marine fleets which combine in a single organization seven transatlantic steamship lines.

From August 1, 1914, to November 11, 1918, 14,988,294 tons (each ton 40 cubic feet) of cargo was carried. This included foodstuffs, munitions, rifles, motor vehicles, tractors, ambulances, airplanes, horses, mules, feed and often a cargo of 2000 tons TNT on a single vessel. Late in 1917, when the Allied fuel shortage was most acute, 88,000 tons of oil were rushed abroad in the "deep" tanks of some of our vessels, as an emergency measure, and this helped to relieve a rather serious situation.

Braving constant submarine dangers, navigating always without night-lights and for the greater part of the war without the protection of a convoy, the vessels made 2549 voyages during the war, sailing from New York, Boston, Philadelphia, Baltimore, Savannah, Brunswick, Ga., Mobile, New Orleans, Galveston, Portland, Me., Montreal, Quebec and Halifax.

Between April, 1917, and armistice day—while the United States participated in the war—521,913 Americans, *constituting more than one-quarter of the entire American Expeditionary Force*, were carried safely to Europe on 295 voyages. In addition, 186,697 Canadian troops and Chinese labor battalions (the latter for salvage purposes), were transported to the front, as well as 112,000 troops from Australia and New Zealand on the long, long trail to the firing-line.

The *Olympic* without doubt made the best record of any of the very large ships of the world, having seen the longest and most continuous active service. She carried during the entire war over 200,000 persons (American and Canadian troops), and returned to Canada the wives and children of Canadian soldiers, when the food question became so acute. In one year (1916) alone she made ten trips between Halifax and England with 55,696 military passengers. During the war she steamed 184,000 miles, consuming 347,000 tons of coal, without the slightest delay or accident to her machinery, an achievement never before accomplished by any ship. The *Olympic* also sank a submarine, and, on April 19, 1917 (the anniversary of the Battle of Lexington), the S. S. *Mongolia* fired at and hit a German submarine in the English Channel—the first American shot fired in the war.—*Scientific American*, Mar. 20, 1920.

ENGINEERING

ON FUTURE POWER SUPPLY.—Dr. C. P. Steinmetz, of Schenectady, N. Y., gave his annual lecture recently before the Chicago Section, A. I. E. E., and Electrical Section, Western Society of Engineers, on "Power Supply and Generation of the Future."

In our civilization of to-day two things are vitally necessary, said Dr. Steinmetz. One of these is materials, the other energy. As regards energy, the question is how to obtain and how to supply it. In obtaining energy, man has called upon nature's most readily convertible sources of energy, coal (including oil and gas) and water power. Chemical and electrical energy may be transmitted, but for general distribution only electrical energy is available.

The modern industry of power supply is covering the country with transmission lines at high voltage, some of the generating stations being at the mines to eliminate coal transportation. There might well be more. In this country 800,000,000 tons of coal (including oil and gas) are consumed annually.

Consideration of water power as an alternative source of energy shows that if every drop of rain were utilized the water power would equal only about one fourth of that now supplied by coal.

Of course this could not be done but taking one fifth of that amount as available for power production through the use of dams and lakes, etc., (about 200,000,000 kw.-yrs.) and assuming that a ton of coal is equivalent to one kilowatt-year, it is seen that possible water power is only one-twentieth of the present ever-increasing power supply derived from coal. But water power should replace coal where possible and would result in a big saving.

Turning to other sources of energy, Dr. Steinmetz next spoke of energy derived from wind and suggested windmills and small generators upon transmission-line structures as a possibility. Referring to tides, he said it would be necessary to change tidal energy to ordinary hydraulic energy, equivalent to a low head waterfall with a changing head, in order to secure results.

Solar energy, while not feasible to-day, presents vast possibilities for the future and 100 times as much energy, theoretically, is available from that source as from coal and water combined. He also touched on obtaining volcanic heat from shafts sunk into the earth, radio activity, the energy of atoms and divers other complex aspects of future power production.—*Tech. Engineering News*, March, 1920.

THE FUTURE OF MARINE PROPELLING MACHINERY.—Many ships propelled by steam turbines and reduction gears have been put in service within the past two or three years, and valuable information as to durability and economy of operation is now in existence. It is very desirable that this be made public for the guidance of engineers and ship owners.

Several types of geared turbine equipment have given exceedingly satisfactory results, but there is considerable reason for questioning the ultimate desirability of gearing. Fuel economy of the main propelling unit alone does not necessarily control the over-all cost of operation, and many reciprocating engine ships are still relatively satisfactory in this respect.

The steam-turbine-electric drive, with water-tube boilers and oil fuel, appears to offer the only solution for navy and passenger vessels of above 30,000 and 40,000 horsepower, though the steam turbine and single-reduction-gear drive is well adapted for such vessels having less power than those named.

For cargo vessels where the power is from 2000 up to perhaps 6000 horsepower the best solution appears to be the heavy-oil engine with electric drive. Two oil engines can readily be installed in a single-screw ship, to drive generators at approximately constant speed. The arrangement would be quite flexible with regard to overhaul and maneuvering, as either engine alone would ordinarily be available for propulsion. The fuel and space economy with such an arrangement should be very good as compared with a steamship, although the cost of engine-room service would probably be greater. A great advantage in using electric drive in connection with oil engines is that the engines can be built to rotate always in one direction—the motor on the propeller shaft being reversible.

An alternative arrangement has been proposed consisting of two heavy-oil engines direct-connected to two sets of propeller shafting. This would be, in some respects, simpler than two oil engines with electric drive and single screw, but, on the other hand, the propellers would be smaller and in more exposed position with twin screws, and the first cost of the vessel would be considerably higher. The choice for oil-engine-driven cargo

vessels seems to lie, however, between these two types, pending the probable development of relatively large engines suitable for direct drive.

The use of the geared turbine drive during the war emergency was undoubtedly justified because, at the time contracts were let, turbines and gears could be manufactured much more quickly and in greater numbers than reciprocating engines.—*Power*, Mar. 23, 1920.

WHY OUR OIL SUPPLY IS LIMITED.—Assuming a population of 108,000,000, the consumption per person in the United States during 1918 was 3.4 barrels of petroleum, says *Petroleum Magazine*. The oil that has been produced since 1859 amounts to about 45 barrels per person, and the oil yet underground, according to the most careful estimate, amounts to about 67 barrels per person.

If the population of the United States remained unchanged and the rate of consumption did not change, the oil available would last about 20 years. But the population is continually increasing and the demands for petroleum are multiplying, so that in less than 20 years the known domestic underground fields will be exhausted if the statistics are even approximately correct. Oil shales are not considered in this connection as a source of fuel oil.

This conclusion does not mean that fuel oil users wil be unable to obtain supplies, for the data apply only to the sources of petroleum within the United States. There are vast fields in Mexico and Russia, from which oil may be obtained, but of course at increased cost because of the transportation expense.—*Power*, Mar. 23, 1920.

FIX ROYALTIES ON OIL LANDS.—Production royalties ranging from 33⅓ to 12½ per cent on the lease of government oil lands under the claims relief section of the land bill were prescribed in regulations issued to-day by the Interior Department. Practically all withdrawn lands now being operated under claim are made subject to the assessment.

With the maximum one-third royalty applying to all wells producing 200 barrels or more a day, the quality of oil being specified as "30 degrees Baumé or over," the assessment is graduated according to production down to the minimum of 12½ per cent for wells producing less than 20 barrels per day. For oil below that quality the maximum royalty is fixed at 25 per cent with the same minimum.

These royalties apply to all government oil lands upon which claimants located prior to their withdrawal under the act of September 27, 1909, and which are producing practically all the oil now flowing from the withdrawn areas. They are not prescribed for the lease of claims on subsequently withdrawn lands, which are for the most part as yet unproven or unproductive. A minimum royalty of 12½ per cent on such leases is fixed by the act.

Rigid restrictions for enforcement of the general provisions of the act denying leasing rights to citizens of any country which does not extend "similar privileges to citizens or corporations of this country" is a feature of the regulations.—*New York Times*, Mar. 16, 1920.

NAVY'S HELIUM GAS PRONOUNCED PERFECT.—One of the foremost scientists in the world, Prof. Kammerlingh Onnes, of the University of Leiden, Holland, has written to the Bureau of Steam Engineering, Navy Department, pronouncing the helium gas produced by the navy to be practically perfect. The letter was in acknowledgment of the receipt of six cylinders of helium sent to Leiden in September, 1919, by the bureau, Professor Onnes writes: "I find gas practically perfect. You will allow me, therefore, to express my full admiration for the remarkable work of the United States done in this domain." Professor Onnes, who is said to be the only scientist who has been able to liquefy helium, makes the offer that in case the Navy Department should send representatives over to his

laboratory to carry on scientific work of any nature pertaining to the properties of the gases hydrogen, neon, helium, etc., these representatives will be permitted to use the annex of the professor's laboratory, which is practically a duplicate of the one he now uses.—*Army and Navy Journal*, Mar. 13, 1920.

LOOP AERIALS FOR SUBMARINES.—According to a paper recently read before the American Physical Society, the submarine loop aerial as finally perfected consists of two insulated wires earthed at the extreme ends of the hull of the submarine, carried over suitable supports to the bridge and thence through radio lead-ins to the receiving and transmitting apparatus. Experiments have shown that communication at sea can be carried on under all conditions more efficiently with such a loop than with the ordinary antenna. The maximum depth of submergence at which signals can be received is determined by the wave length. For short wave lengths the top of the loop must be near the surface of the water, whereas a wave length of 10,000 meters can be received when the top of the loop is submerged 21 feet. Signals can be transmitted from the loop, using a 952-meter wave length, to a distance of 10 or 12 miles when the top of the loop is practically at the surface. The range decreases to two or three miles when the top of the loop is eight or nine feet below the surface. The loop can also be used as a direction finder, maximum signals being received when the submarine is pointing toward the transmitting station.—*Scientific American*, April 3, 1920.

A GLYCERINE SUBSTITUTE.—According to a German patent soluble magnesia salts of butyric acid can be considered satisfactory substitutes for glycerine especially when in combination with a small amount of alcohol or glycerine. The butyrate is very viscous, neutral and has a low freezing point. It is non-corrosive, forms a clear solution in water, and mixes satisfactorily with glycerine and its substitutes.—*Scientific American*, Mar. 20, 1920.

AERONAUTICS

SPEEDS AT HIGH ALTITUDE.—According to the experimental data in the possession of the technical sections of the air service it has been found that at a height of 20,000 feet an engine gives only 45 per cent of the power for which it is good at sea level. The great value of the surcharger now being used with some engines lies in its ability to make a motor yield the same power at 20,000 feet that it does in flying at the lowest altitudes. Whereas the Lepere biplane recently used by Major R. W. Schroeder in an altitude record flight of 31,800 feet, with one passenger, is capable of a speed of 136-137 miles per hour at sea level, at 25,000 feet, where most of the air fighting is expected to take place in the next war, the machine, equipped with the surcharger, has shown a speed of 134 miles.—*Scientific American*, April 3, 1920.

WORLD'S LARGEST AIRSHIP.—The German Zeppelin *L-72*, largest ship of the air ever constructed, has a tip to tip length of more than 900 feet. It was built during the war expressly to bombard New York. Advice from Berlin states that Americans, French and British have all entered claims for it as a war trophy.—*Scientific American*, April 3, 1920.

TRANS-CONTINENTAL PASSENGER AIRPLANE LINE.—Alfred W. Lawson, a pioneer in American aviation and the designer of the splendid Lawson liner which has made an excellent showing in several exhibition flights, has set July 1 next as the date for starting the operation of a New York-San Francisco passenger airplane line. The first airplane is scheduled to leave New York at 1 a. m., Mr. Lawson states, with accommodations, including sleeping berths, for 26 passengers. The schedule calls for a 36-hour trip

with stops at Syracuse, Buffalo, Cleveland, Toledo, Chicago, Des Moines, Omaha, Cheyenne, Salt Lake City, and Reno. The airplane body to be used is 50 feet long and 6 feet wide and the ceilings are 8 feet high.—*Scientific American*, April 3, 1920.

CLOUD FORMATION IN THE WAKE OF AIRPLANE.—The formation of a ribbon of cloud in the wake of an airplane has been reported several times. A striking phenomenon of this character is described in *Die Naturwissenschaften* as having been observed over Munich on May 11, 1919. An airplane flying at a height of more than five miles left behind it a long narrow streak of cloud, which persisted for more than an hour and attained a length of more than 30 miles. The cloud gradually broadened, and was marked by waves or knots at intervals. Spectators compared its shape to that of the skeleton of a snake, with vertebræ regularly spaced along it. At one time this cloud drifted over the sun, and a fragment of the 22-degree halo appeared, indicating that the cloud was composed of ice particles (as would be expected at that altitude).—*Scientific American*, April 3, 1920.

THE LESSON OF THE FLIGHT TO AUSTRALIA.—The outstanding lesson taught by the army long-distance flight across the American continent and back which was held last summer, was the crying need for suitable landing fields; and as the fuller details of the recent 12,000-mile flight from England to Australia are made known, the same lesson is taught with even greater emphasis. The first stage towards long-distance flight was reached when the airplane was developed to a point where it was thoroughly reliable for non-stop flights over great distances between selected points. That the airplane has reached that point of perfection has been proved many times during the past two years, notably in the non-stop flight of the Vickers-Vimy bombing machine from Newfoundland to Europe, and later during this remarkable 12,000-mile journey, in which the appointed resting places were reached without mishap. But when we come to the question of starting and stopping grounds, there is quite another story to tell, and it is evident that the question of aerial transportation depends upon the provision of carefully selected, well-drained and thoroughly equipped landing grounds.

The landing experiences of the Australian flight seem to be now repeated in the attempted flight throughout the length of the African continent. If long-distance aviation is to become a commercial success, a large share of future appropriations, whether governmental or private, should be devoted to the provision, not of extemporized, but of thoroughly well-built and completely equipped aerodromes, with all facilities for obtaining fuel supplies, stores and other indispensable necessities.—*Scientific American*, Mar. 13, 1920.

ITALIAN DIRIGIBLE TO FLY TO BRAZIL.—A 25-passenger dirigible constructed by Italy will attempt a flight from Rome to Rio de Janeiro in June. An effort will be made to keep up a speed of 50 nautical miles per hour and complete the flight in 110 hours. The dirigible is 300 feet long and weights 34 tons. It has four motors of 260 horsepower each.—*The Naval Monthly*, April, 1920.

INEXPENSIVE AIRPLANE MOTOR.—It is interesting to note that the demand for inexpensive airplanes is bringing about the wide use of the Ford automobile engine for aerial purposes. This type of motor has been used to good advantage on a number of single-engined and multiple-engined airplanes, and, despite its somewhat great weight for its horsepower, it proves very satisfactory because of its reliability. And as a result of all this at least one manufacturer has gone into the business of making modified Ford engines particularly suited to airplane service. One of these develops 35-40 horsepower at 1800 revolutions per minute.—*Scientific American*, Mar. 13, 1920.

TESTS OF MARTIN TORPEDOPLANE.—Opening a wonderful new field of naval warfare, the official tests of the Glenn L. Martin torpedoplane were made on February 11th at the flying field of the Glenn L. Martin Company at Cleveland, Ohio. The big plane shattered a number of records for speed and climb under heavy load and exceeded not only the contract specifications for performance but even the most sanguine expectations of its builders.

With three men, two machine guns and ammunition, four hours of fuel and a big torpedo weighing 1650 pounds, a total weight of 10,300 pounds, the huge machine left the ground in 14 seconds. With a ten-minute climb on the program in the course of which the specifications demanded that he reach an altitude of 4000 feet, Springer nosed the plane toward the sky and had reached his 4000-foot mark in exactly six minutes according to the official time. In ten minutes the plane reached 5800 feet, almost a 150 per cent performance.

His climb over, Springer brought the plane down to an altitude of 1000 feet for two speed trials over a measured course of one mile. The contract in this case called for a high speed of 105 miles per hour, but the average speed shown on the two trips was 112.25 miles per hour. It is expected that when the proper allowances are made for the altitude, etc., that this mark will be brought up to 114 miles per hour, a most noteworthy performance.

The performances were made before a trial board of naval officers who had journeyed to Cleveland for the tests. All were apparently very much pleased with the results of the test, and it was announced that the plane will be flown to McCook Field, Dayton, when the army officials will have a chance to see it perform, after which it will probably be flown to Bolling Field, Washington, D. C.

The big plane is in practically every respect a duplicate of the well-known Martin Bomber, the chief difference being found in the landing gear, which has been split to allow the carrying and launching of a full-sized navy topedo weighing 1650 pounds. Otherwise there is no essential difference beyond the improvements in detail which might be expected from a progressive aeroplane factory. The plane has a span of 71 feet 5 inches, a height of 14 feet, and is 46 feet from nose to tail. It has no stagger, no sweepback and no dihedral.

This big plane is unquestionably one of the most versatile ships ever produced in this country or any other. It has equipment for taking care of every type and size of aerial bomb from the smallest to the 1650-pound regulation navy torpedo. It has large fuel capacity and machine gun armament, so that it may be used without bomb load for reconnaissance work and if necessary for combat flying at sea. The two 400-horsepower Liberty motors furnish ample power, and either one will fly the plane with full load. In addition the twin-motored feature adds to the ease with which the plane may be maneuvered. It has been demonstrated, for instance, that the plane can be safely landed with rudder controls completely out of commission by steering with the motors.

The use for which this plane is primarily designed is that of acting as an aerial torpedo boat in naval warfare. It can take off from the deck of a sea sled or mother ship and cruise around until its victim is sighted. Then dropping at a speed of over 2 miles a minute it can get so close to the victim before launching its torpedo that a miss is almost impossible, while its great speed and comparatively small size make it an extremely difficult target to hit. Should, however, the plane be hit and destroyed, the loss of life and property is almost negligible as compared with that resulting from the loss of a torpedo-boat destroyer.

The Glenn L. Martin Company has an order for ten of these planes, and has now completed two. The remaining eight should be completed during the spring and will give the U. S. Navy an aerial equipment without an equal.—*Aerial Age Weekly*, Mar. 8, 1920.

A PROPOSED TRANSATLANTIC FLIGHT.—Again it is reported that a French machine will shortly attempt an Atlantic flight. The route chosen is that old French favorite—from Dakar to Pernambuco, and an attempt will probably be made in April or May. Although the distance between the two towns is some 1900 miles, the machine will be able to cover over 3000 miles without a stop. It will be fitted with three engines, which, instead of being isolated and each actuating an individual propeller, will be grouped in a common engine room. They will be able to work together, and in the event of one or more of the engines failing, the inoperative machinery can be isolated and repaired while the remaining engines sustain the airplane in the air.—*Scientific American*, Mar. 13, 1920.

KITE BALLOONS TOWED AT HIGH SPEED.—Tests made recently at the navy air station, Pennsacola, Fla., with kite balloons anchored to Eagle boats proved highly satisfactory. The experiment of hauling down the balloon to the deck with the ship making a speed of 14 knots was accomplished without difficulty. During the tests on shore with a kite balloon at an altitude of 500 feet in a high wind, the balloon had its stabilizer carried away, but while swinging through an arc of some 200 feet the three parachutes attached to the basket opened, and these acted as tail cups, bringing the balloon into a safe riding position. This accident developed a new idea in balloon control, and it is considered that under similar circumstances a pilot might save himself from disaster by opening his parachute to act as a stabilizing tail cup.—*Army and Navy Journal*, Apr. 3, 1920.

AERIAL PHOTOGRAPHY is so much in everyday demand that the Curtiss organization has seen fit to inaugurate an aerial photography department. Captain Morrell, recently of the Royal Air Forces, in charge of the new department, has the following to say: "Every air picture shows most of what four views taken from the ground can show, plus the view from above, which the camera cannot usually get from the ground at all. I believe that important factories and other large business, as well as all important municipalities, will soon be considering air maps and air views as a necessary means of presenting themselves and their advantages to the public. Aerial photographs of harbors, congested city districts, etc., for scientific purposes will be made. Real estate offices will wish to show the nature of their properties by an agency which is as accurate as a map and far more vivid. Timber properties, Forest Patrol Service, U. S. Geodetic Survey, etc., will utilize the aerial camera."—*Scientific American*, Mar. 13, 1920.

LIGHTER-THAN-AIR RESEARCH STATION.—Fort Omaha, the official lighter-than-air experiment and research station of the Army Air Service, is making preparations to prosecute actively a great volume of development work made imperative by the rapid strides in lighter-than-air craft. This work has been hampered by lack of personnel, caused by conditions attendant to demobilization. Arrangements have been made to secure competent civilian engineering specialists, covering the entire range of work involved, in mechanical, structural and chemical engineering, who will constitute a research and experimental board to invent, design, construct, revise and test all equipment as required for the lighter-than-air branch of the Army Air Service.—*Army and Navy Journal*, Apr. 3, 1920.

SEEKING THE SEVEN-MILE CEILING.—*Details of Major Schroeder's New Altitude Record of 36,020 Feet.*—In the week of August 22, 1909, there was held at Rheims the first international airplane meet. Those of our readers who still have in their possession our issues of September 4 and 11 in that year will doubtless read with amusement the account then given of what were to that date record-breaking performances of outstanding character. Farman and Bleriot and Curtiss and Latham flew at speeds in the neighbor-

hood of 45 miles per hour; they stayed in the air for three and four hours; they covered 100 and 200 miles in single flights. But the particular item which is of major interest right here is the winning by Latham of the prize for altitude with a mark of 155 meters (508 feet). Perhaps some idea of what this meant at the time may be gleaned from considering one of the speed events in which two of the contestants "flew within 12 feet of the ground," to quote our correspondent at Rheims, while the third risked life and limb by venturing to the extreme height of 150 feet. Later in the week Latham himself covered part of an endurance flight at the "prodigious height" of 300 feet!

These early efforts to boost the ceiling of the airplane were fraught with altogether as much of the pioneering spirit as the present-day assaults upon the altitude record; but in comparison with late performances, they look feeble enough, to be sure. In spite of the fact that we have pushed the airplane to heights more conveniently measured in miles than in feet, we continue to eclipse existing records by margins greater than the entire distance between Lathan and the ground when first he won an altitude prize. Thus, last year Rohlfs set the mark at 34,610 feet; and last week—at least it was last week as we wrote these lines—Major Schroeder has gone him 1410 feet better in taking his machine 36,020 feet off the ground.

The question "Where will this thing stop?" which first occurs is really of less interest than the question "How do they do it?" and "What is the weather like up there?" They do it, in fact, with surprising ease, if we rule out for the moment the question of physical discomfort. Major Schroeder rode in a La Pere machine, with a 400-horsepower Liberty motor. The development of this full amount of power at all altitudes independently of the reduced supply of oxygen from the extremely rarified air, is made possible by the supercharger. This, as our readers will recall, is a gas turbine plus a centrifugal air-compressor. The turbine gets its power from the exhaust, and at 22,000 revolutions per minute it is easily able to operate the compressor so as to insure for the engine a supply of air at the full 14.7-pounds pressure of sea-level. After that high flying becomes merely a matter of personal courage and endurance.

Major Schroeder on his record-breaking flight was dressed more heavily than any Arctic explorer. Between the fur and the outer lining of his costume were flexible electric heating-units, connected by silk-covered wires with the power plant of the plane. Gloves, headgear and moccasins were similarly equipped; while the aviator wore an oxygen mask which guaranteed that he as well as the engine get the necessary amount of oxygen—a human supercharger, save for the fact that it employed stored oxygen from tanks instead of concentrating the atmosphere to the desired point.

Perhaps a word about the conditions seven miles above the earth's surface will not be out of place. Major Schroeder could tell us something of these, if that were necessary; but fortunately we possess more convenient means of finding out. Seven miles is an altitude very easily reached by kites and balloons, which can with equal ease carry automatic registering instruments of one sort or another. In this way we know that at an altitude of seven miles the temperature runs pretty uniformly around the 60-below-zero mark on the Fahrenheit scale. We know that, over the United States, the wind at this height blows steadily from the west at a speed somewhat in excess of a mile a minute. With these figures before us, we may be prepared to believe that the setting of altitude records is a pretty frigid business.

Although Schroeder says he is going up again, his experience was quite sufficient to bear out this remark. For one thing, when he landed he was temporarily, though none the less completely, blind. For vision depends, among other things, upon the liquid state of the "humors" inside the eyeball. At the surface of the earth, so far as we are aware, these latter never freeze; but they obviously have a freezing point, and it appears that Major Schroeder found it; for he landed with his eyes completely frozen.

This was not the only bizarre incident of the flight. When he became blind from the cold and unconscious from exhaustion of his oxygen tanks, Major Schroeder of course lost control of his machine, which plunged toward the earth. Before the falling plane itself became visible, observers on the ground saw what looked like the tail of a comet suspended in the air beneath the clouds. The exhaust vapor frooze in the air, and hung behind the plane in a long stream giving this effect, and leading to much wild speculation. Finally the falling plane was made out, and its occupant given up for lost; but at a height of barely 2000 feet, while he was completely unconscious, his flying reflexes got to work and he righted the plane and glided to a landing.

The change from an atmospheric pressure of three pounds per square inch at seven miles to nearly 15 pounds at the ground was so sudden and so severe that the gasoline tanks on the machine were crushed in, and the aviator may count himself lucky that he did not suffer serious or even fatal injury from bends. But just to show that no little things like these can scare him, Major Schroeder says that as soon as he is able to fly again he is going after a record of 40,000 feet—with a bigger supply of oxygen, to the failure of which he attributes all his misfortuntes on the voyage of February 27.—*Scientific American*, Mar. 13, 1920.

A MAN-SIZED HELICOPTER THAT LEAVES THE GROUND WITH FULL LOAD.—The helicopter—that type of flying machine which has been the subject of so much ridicule in the past—is about to be realized in a practical form. It is not so long ago that these columns contained a description of the interesting experiments carried out by Messrs. Hewitt and Crocker, with a huge helicopter driven by an electric motor. And now comes Henry A. Berliner, of Washington, D. C., with a small, one-man helicopter which, in the preliminary tests, has actually left the ground with its pilot and full load. Here, it would seem, is the foundation for a practical helicopter.

It would be useless to review the many attempts at making practical helicopters in the limited space here available, since any reference book contains a more or less complete account. Suffice it to state, however, that we have here to do with the work of father and son—Emile Berliner and Henry A. Berliner, of Washington, D. C. Emile Berliner, it will be recalled, was one of the pioneers in the phonograph and telephone fields, and an inventor of note. About the time that the Wright Brothers first succeeded in flying, Emile Berliner took up the problem of the pterophore or helicopter, and towards that purpose he had a western firm build for him two light-weight revolving cylinder motors, which antedated the famous Gnome and LeRhone motors by some years. In fact, one of these motors is on exhibition at the U. S. National Museum.

In the intervening years between 1908 and the early summer of 1919, Emile Berliner carried on numerous experiments with helicopters and lifting propellers of all kinds, shapes and sizes. His experiments were met with a moderate degree of success; indeed, as early as 1909 one of his helicopters lifted a man from the ground, but such lifting was not steady and was more in jumps and starts. At any rate, Berliner laid the foundation for a practical helicopter, while his son, Henry, was obtaining a store of scientific knowledge and training at the leading engineering institutions of the country, as well as in the aerial service.

The present Berliner helicopter weighs 570 pounds, and is equipped with an 80-horsepower LeRhone rotary engine. The two propellers, driven in opposite directions, are 13 feet in diameter and 10 inches wide, and the total perfectly steady lift has in actual tests proved to be near 900 pounds, or 60 pounds per square foot of *effective* lifting surface. The average airplane has an average lift of only eight pounds per square foot. The head of the helicopter—or gyrocopter, as the Berliners call their machine—is small, and great forward speed may be expected from it. When the machine is tilted forward it will fly horizontally. The tilting is accom-

plished by changing the center of lifting pressure. According to Emile Berliner, an inclination of 15 degrees means a lifting loss of less than 3 per cent, and the horizontal push should be about 25 per cent of the lifting power.

Of course, the Berliner helicopter is still in the experimental stage, and much remains to be learned not only as regards refinements in the design, but in the whole art of flying such a machine. Emile Berliner has always intended that his gyrocopter should be provided with floats and that in the beginning it should be a water craft, flying low near the surface of rivers, lakes and ocean so that it could quickly descend to safety in case of accident or engine failure. Further developments may result in some means of coming down on land from great heights, just as safely as an airplane does when its motive power fails.—*Scientific American,* Mar. 27, 1920.

MISCELLANEOUS

VIRGIN ISLANDS WANT NAVY CONTROL.—Representative Towner, of Iowa, before the House Committee on Naval Affairs on March 9, stated that the authorities and the majority of the people of the Virgin Islands desire that the navy continue its administration there. Navy government had its inception there three years ago when the United States acquired the islands by purchase from the Danish Government. Secretary of the Navy Daniels, Admiral Robert E. Coontz, chief of naval operations, and Comdr. P. W. Foote, the Secretary's aid, were very much interested in Mr. Towner's report of the efficiency of the navy in its governmental capacity on the islands. Mr. Towner presented figures showing that the present revenue of the islands totals approximately $240,000, but in his opinion this could be largely increased. "At present and for some time," said Mr. Towner, "the unoccupied land there has gone untaxable. Sugar is raised on the islands, but its tax is very low." Mr. Towner indicated that the Virgin Islands offer a large field for commercial enterprises and for development. He added that Secretary Daniels made the statement that it was his (the Secretary's) desire to take the navy away from the islands this year. "The people desire to be governed by the navy," said Mr. Towner, who estimated that an appropriation of $32,000 will be required for administration during the next fiscal year. He stressed the importance of establishing high schools on the islands. Chairman Butler concluded the hearing by stating that high schools should be erected there and he requested Mr. Towner to present his testimony in the House when the Naval Appropriation Bill comes up.—*Army and Navy Journal,* Mar. 20, 1920.

GERMANY TO SURRENDER REMAINING WARSHIPS.—The remaining German warships were to be transferred to the Allies on March 10. Eight battleships, 11 cruisers, and 42 destroyers were to be surrendered on that date. Seventy per cent of them will go to Great Britain, 11 per cent to Italy and 8 per cent to Japan.—*The Naval Monthly,* April, 1920.

THE NAVAL DRY DOCK PROBLEM.—The astonishing increase in the beam of capital ships which has taken place of late years has rendered the question of dry docks to accommodate these vessels a most acute one. An instance of this was seen in the recent trials of the battleship *Hood,* which, because of the blisters had extreme breadth of 104 feet, and was unable to be docked at any of the English Channel yards and had to proceed to one of the North Sea ports before she could be accommodated. The question is now receiving the serious attention of the Admiralty. Fortunately, we have six 1000-foot docks built or building, which will be capable of accommodating our latest dreadnoughts of equal or slightly greater beam. It is evident, however, that this dry dock question will be the limiting feature,

when the question of further increase in battleship dimensions comes up for consideration.—*Scientific American*, Mar. 20, 1920.

BRITISH CRUISER "HAWKINS" ON CHINA STATION IS NEW TYPE.—The British cruiser *Hawkins*, a new type, is on duty on the China station as the flagship of Vice-Admiral Sir Alexander Duff. The *Hawkins* has great speed, fine fuel endurance and a powerful armament, since she was designed to run down commerce raiders such as the *Moewe*. The *Hawkins* has a length over all of 605 feet, a beam of 65 feet, and a displacement of 9750 tons. She has considerable torpedo protection and it is believed she would still be in condition after receiving two torpedoes. The ship carries seven 7.5-inch new model guns and twelve 3-inch quickfirers. She carries both oil and coal and has boilers for either.—*The Naval Monthly*, April, 1920.

DECLARES GERMANY CAN PUT ARMY OF 3,400,000 IN FIELD.—Germany, in the event of mobilization, can place an army of 3,400,000 men in the field, says Henri Bidou, the well-known French war correspondent, in a dispatch to *Le Journal* from Mayence.

He adds that Germany has secretly re-enforced her once famous war machine, which in 1918 was virtually shattered. Officers, he says, are available to command an army of 4,000,000 men.—*New York Times*, Mar. 27, 1920.

DISMANTLING OF HELIGOLAND COMPLETED.—A dispatch from Berlin to the Associated Press states that the Heligoland defenses are to-day dismantled. The island and its thousands of tons of masonry and gun emplacements is all that remains of this once most formidable fortress. With the guns dismantled, the destruction of the military harbor works and various fortifications has proceeded. Although this stronghold cost over 175 million dollars. its guns were fired but once throughout the war, when the British warship *Shannon* was the target. The Allies recognized that it would have been impossible to silence its batteries. The artificial harbor works and the ground on which the barracks stand are to be removed and the site returned to the sea.—*Scientific American*, Mar. 20, 1920.

SECRET RADIO SIGNALLING.—John Hays Hammond, Jr., has recently developed a system of military radio telegraph communication which cannot be intercepted by any present form of radio receiver. While it is not known how he accomplishes this wonderful feat, it would seem that it is based on some method of superimposing radio frequencies. Such a system might operate after this fashion: If, for example, a continuously oscillating transmitter tuned to 150 meters were to be modulated at desired intervals by a key-controlled circuit tuned to 25 meters, and properly coupled to the former circuit, a complex wave form would be emitted, and signalling on this system could be intercepted only by a receiver specially equipped to discard the 150-meter carrier wave and heterodyne or rectify the 25-meter modulations which convey the elements of the Morse code. It would be almost impossible for an enemy to interfere with reception by any system of malicious jamming. Because of the inefficiency of the vacuum valve on very short wave lengths, especially constructed tubes might be particularly advantageous in the short wave circuits. One wonders if absorption to a marked degree would not be encountered were such a system installed amongst the metal rigging and gear of warships. While the employment of higher wave lengths would partially overcome this difficulty, it would greatly increase the chances of undesired reception.—*Tech. Engineering News*, Mar., 1920.

SHIPS AND MEN.—There appears to be in certain quarters a kind of agitation in regard to the strength of the British Navy, and attention is concentrated upon the number of ships in commission. This is not, however, the right way to regard the matter at all. Although the international situation at the moment might, for example, justify the government in reducing the numbers of ships in commission by half, in a comparatively short time a sudden change on the horizon might call for an increase, which could not be made as simply and quickly as the reduction. The point is that a certain number of vessels must be kept in commission for the training of officers and men, even if it should happen that these will never be required to fight in the forms of battleship or cruiser, destroyer or submarine which exist to-day. The real strength of a navy cannot be improvised. Many new types of ships and special services were created during the war, but these were growths out of the main tree-trunk. As Mr. Hurd says in the new *Fortnightly*, "the naval war was won by the gunned, armored, and swift surface vessels of the British fleet, whether battleships, battle cruisers, or light cruisers; and everything else, destroyers, submarines, and aircraft were extensions of the power which resided in those large ships." In training officers and men for the regular naval service, it is necessary to look well ahead.—*The Army and Navy Gazette*, Feb. 21, 1920.

WHAT THE NEW BRITISH ARMY IS FOR.—The new army is to be precisely what the Expeditionary Force once was, a symbol, if a splendid one, that this country will not prepare for war on land. The theory, which as held by us, was one of the contributing causes of the great war, is put together again. That theory was that England could maintain her neutrality by means of her fleet and, if she could not, that the fleet would form a rampart strong enough for her to organize armies behind it. But dangerous to security as the theory was before 1914 it is more so now. In the first place Germany in the past had no motive for breaking the peace but greed. In the future to greed will be added revenge and an overmastering desire to restore her lost prestige. In the second place for the relatively stable Europe and stagnant middle east of the past there is the devastated, revolutionary, and chaotic Europe and middle east of the present, with the possibility of tremendous upheavals looming up on the far horizon. Apparently the government assumes that the garrisons on the Rhine, in Constantinople. Egypt, and northwest Persia are temporary, and that the garrisons in Mesopotamia and Palestine can be "enormously reduced" if those territories "are not to be anything but a burden to the British treasury." Such misplaced optimism is on all fours with our misplaced optimism before the war. But if, in the next 10 or 15 years, another emergency should arise "we must trust to the fleet and the air to give us time for a year or two to bring the irresistible might of Britain into the field." But we cannot do that as we did before because the wealth that enabled us to succeed so well is gone, and we are heavily in debt.—*The Army and Navy Gazette*, Mar. 7, 1920.

THE SUBMARINE IN WAR.—In considering what the submarine may be expected to do in a future war, the only safe guide is to have a thorough knowledge and proper appreciation of its effect in the late conflict. From this starting point, and modified by the advance in material on the one hand, and any changes in the geographical situation on the other, there should be developed a rough idea of the future potentialities of such craft and the relationship they will bear to other types. It is all to the good, therefore, that some further facts should now be available from enemy sources concerning the output of U-boats during hostilities, and the extent of the losses sustained by them. Taken in conjunction with the tables compiled from British official information which have been pub-

lished in the journal of the Navy League, these new figures from the German Marine Office give a fairly complete and accurate outline of the extent of the submarine effort, and serve to clear away many erroneous views.

There is no longer any doubt about the number of completed and effective submarines with which Germany started the war. The total was 28, and three more added before the end of 1914 increased it to 31. On the other hand, five were lost from all causes during 1914, so that on Jan. 1, 1915, when he was preparing to attack commerce, the enemy had fewer boats ready for this purpose than when war broke out. Various reasons are given by Grand Admiral von Tirpitz in his book for the number being so small. The ten long-distance boats, for instance, would have been doubled if the promised deliveries from building firms had been kept. This is of small account, however, for those which were not completed in 1914 became available for the attack of the next year. There were finished during 1915 62 submarines, and the losses from all sources amounted to 20, so that a net gain of 42 increased the number available at the end of the year to 68. This gain was accentuated during 1916, when there were completed 95 new submarines, and only 25 were sunk, increasing the total at the end of the year to 138. Turning now to the British official figures of merchant ship losses, the remarkable thing is that these numbers of submarines achieved so little. In 1915 they destroyed 227 merchant ships of all kinds, aggregating about 748,000 tons, and in 1916 287 ships of all kinds, aggregating about 888,600 tons. Remembering our totally inadequate preparations against such an attack on commerce, it says much for the energy and ingenuity shown by the Admiralty in 1915 in improvising methods of defence that the avowed threat of starving us out was frustrated. Lord Selborne's declaration on August 26, 1915, that the submarine menace was "well in hand" was amply justified by such knowledge as the Admiralty then had, for the tonnage losses were decreasing. But the view was too short-sighted. It is now shown that although the U-boats were continuously hunted and harassed and thereby prevented from doing much harm, the weapons available for use against them were not decisive enough. Only 32 per cent of the added German submarines were destroyed during 1915, and the proportion fell in 1916 to 26 per cent. It will be observed that with about twice as many submarines in commission during 1916 as in the previous year and with the ratio of loss inflicted on them decreasing, the enemy was only able to increase his "bag" of merchant ships by 18 per cent. The only possible conclusion to be drawn from this is that it shows what a splendid fight was put up by our seamen of all classes in keeping open the trade routes and communications so vital to the Empire's existence.

In 1917 the submarine war attained the height of its violence, and the Sea Services had to pay heavily for the feebleness of the Admiralty policy in 1915-16. To the 138 boats with which she started the year Germany added another 103. Although a formidable contribution, this was only eight more than in 1916, when the output showed an increase of 50 per cent over 1915. For this relief we have to thank the Grand Fleet under Lord Jellicoe at Jutland, since the German shipyards, occupied for so many weeks after the battle in repairing the High Sea Fleet, could not get on with the submarine program. Thanks to Lord Jellicoe's anti-submarine measures when he came to the Admiralty at the beginning of 1917, the number of U-boats sunk rose from 25 in the previous year to 72. Furthermore, these measures, expanded and developed during 1918, accounted for 81 submarines, which total exactly equalled the German output. A recent American authority has sought to belittle the Allied effort by showing that during 4½ years, with over 6000 patrol and searching vessels, only 203 submarines were accounted for. But such a bald statement is misleading, for as has

been shown, the U-boat, in its first and unexpected onslaught, was held in check, then it got beyond control, but only for a short time. In 1918, when Sir Eric Geddes was much perturbed about it, the submarine was almost entirely played out, and any one who examines the facts impartially can hardly escape the conclusion that had the war continued another year the U-boat would have been decisively beaten. The force of the American anti-submarine measures, for example, had hardly begun to be felt, for according to the official lists, only one German submarine was sunk in action by the American Navy. The comment of Admiral von Capelle upon the failure of the U-boat is illuminating. He attributes it to indifferent material and second-rate personnel—not a word about the effectiveness of the British counter measures. But the main lesson of the submarine war is that we ought never again to be left to improvise our defence against it after hostilities have begun.—*The Army and Navy Gazette*, Feb. 21, 1920.

NEW GERMAN FLYING BOAT.—A large Zeppelin flying boat has arrived in this country from Friedrichshafen for a series of demonstrations, coming via Nordeney and landing at an aerodrome near Amsterdam.

The flying boat made the trip over the North Sea, descending frequently to the water.

A special feature of the boat is that the construction is entirely of aluminum and the wings covered with cloth, the result being that wind and weather can do little harm, and she does not need a shed.

The boat weighs 2800 kilograms, her total weight with passengers, fuel, etc., being 4200 kilograms. She has 250-horsepower motors, giving the machinery a speed of 175 kilometers. The pilot's seat is in the forepart of the boat, while the cabin behind is capable of accommodating six passengers and a pilot.—*New York Times*, Mar. 16, 1920.

GERMANY'S FLOATING DOCKS.—According to a statement in the *Schiffbau*, the total tonnage of the floating docks in Germany amounts to 480,868 tons. As the Entente adheres to its demand, whilst our government has not yet replied to it, the present moment is especially suitable for the publication of details regarding the amount of dock-space in Germany. It can be seen with downright frightful clearness that our economic collapse is inevitable if we meekly comply with this demand on the part of our enemies.

According to the list, Germany possesses 13 docks of more than 10,000 tons each, with a total tonnage of 338,500 tons. The proportion of 75 per cent of such docks which the Entente is demanding, is reckoned out cleverly enough. We should lose all the large docks and should only be allowed to keep the old ones and perhaps the off-shore docks, among the rest.—*Hansa*, Dec. 13, 1919.

CURRENT NAVAL AND PROFESSIONAL PAPERS

Range Finders and Range Finding. By Commander F. J. Cleary, U. S. Navy. *Journals of the American Society of Naval Engineers*, February, 1920.

U. S. S. *Idaho*—Description and Official Trials. By Mr. Henderson B. Gregory. *Journal of the American Society of Naval Engineers*, February, 1920.

Future Seacoast Defense Artillery—1st Prize Essay. By Lieut.-Colonel Sanderford Jarman, C. A. *Journal of the United States Artillery*, March, 1920.

Possibilities of the Next War. By Major-General Sir Louis C. Jackson, K. B. E., C. B., C. M. G. *Journal of the Royal United States Institution*, February, 1920.

The Supreme War Council of the Allied and Associated Nations (Its Origin, Organization, and Work). By Lieut.-Colonel R. H. Beadon, C.B.E., R.A.S.C. *Journal of the Royal United Service Institution*, February, 1920.

The Relative Merits of Monocular and Binocular Field Glasses. *Journal of the Franklin Institute*, March, 1920.

The Problems of Engineering Education. By Frank D. Adams. *The Journal of the Engineering Institute of Canada*, April, 1920.

NOTES ON INTERNATIONAL AFFAIRS

FROM MARCH 15 TO APRIL 10

PREPARED BY

ALLAN WESTCOTT, Associate Professor, U. S. Naval Academy

PEACE RESOLUTION ADOPTED BY HOUSE

On April 9 the U. S. House of Representatives, by nearly a two-thirds vote—242 to 150—adopted a joint resolution declaring war with Germany at an end, and sent it to the Senate, where Republican leaders planned to force its immediate consideration.

The resolution, instead of declaring peace, declares the war at an end. It provides that if within 45 days the German Government shall not make a similar declaration and renounce all claims, rights, etc., not granted by the Treaty of Versailles, the President shall stop all commercial intercourse with Germany. Finally, it declares that "nothing herein contained shall be construed as a waiver by United States of its rights, privileges, indemnities, reparations or advantages to which the United States has become entitled under the terms of the armistice signed November 11, 1918."

TREATY DEFEATED IN SENATE.—On March 19, by a vote of 49 for to 35 against, the Senate defeated the Lodge resolution providing for conditional ratification of the Treaty of Versailles. This vote was seven less than the necessary two-thirds. The defeat of the Lodge resolution was made certain after the inclusion on March 18, by a vote of 54 to 26, of a reservation declaring that "the United States adheres to the principle of self-determination and to the resolution of sympathy with the aspiration of the Irish people for a government of their own choice, adopted by the Senate June 6, 1919."

SUMMARY OF FOREIGN SITUATION.—International nervousness is spreading. France's occupation of German territory against the judgment of the United States, Great Britain and other Allied Powers is but one symptom. Throughout the world, as it becomes apparent that there is no central, cohesive, effective instrumentality to enforce the peace treaty, each nation is beginning to look out for her own interests.

Japan, being nervous about the proximity of the Bolsheviki and their doctrines to incipient radicalism in the land of Nippon, has seized Vladivostok.

Italy is tacitly behind D'Annunzio's occupation of Fiume.

Poland has reached out for pieces of Russian territory.

The Near East is a tangle of British and French pretensions in Turkey and Syria.

Germany's socialist government claims her economic ruin is sought by France, and unless it is permitted to put down the revolt in the Ruhr Valley the monarchical party will come back into power.

Marshal Foch and the French generals, putting little stock in German pleas, have influenced Premier Millerand and the French foreign office to take no chances on the allied council of diplomats, which was trying to dissuade France, but to go ahead and take German territory first and talk about it afterward.—David Lawrence, *Washington Post*, April 7.

FRENCH ADVANCE WHEN GERMAN TROOPS ENTER RUHR

GERMAN TROOPS ENTER RUHR.—Immediately upon the failure of Kapp Reactionary Rebellion and the restoration of the Bauer government, radical demonstrations occurred throughout Germany and especially in the industrial region east of the Rhine, where a Red army of upwards of 50,000 workmen moved upon Wessel, Essen and other industrial centers. On March 19 Essen was captured by the Red army after violent fighting in which it was estimated that 300 persons were killed.

According to the terms of the Peace Treaty, and a subsequent agreement of August, 1919, only 25,000 German Government troops were permitted within the 50-kilometer neutral zone east of the Rhine. The German Government as early as March 17 requested of the Allies permission to move additional troops into the Ruhr region, and later renewed this request. On April 2, the French Government, acting independently of other Allied Powers, withheld consent unless French troops should simultaneously occupy German cities east of the Rhine. The German forces, however, entered the region and on April 5 numbered, according to German statements, 43,000; according to French estimates, 160,000. These forces succeeded in reestablishing order and coming to terms with the workmen organizations.

FRENCH OCCUPY RHINE CITIES.—As a "coercive and precautionary measure," "to bring Germany to a due respect for the Peace Treaty," large bodies of French troops were on April 6 ordered to cross the Rhine, and occupied Frankfort. The occupation took place quietly, though several German civilians were killed or wounded by the French in a street disturbance on April 7.

PREMIER MILLERAND DEFENDS ACTION.—Prior to this action, Premier Millerand notified the Allied Powers and asked their cooperation, but stated that France was prepared to act alone if necessary. On April 7 the French Government issued a long note defending its course, in part as follows:

"On April 2 Premier Millerand confirmed to the German Chargé d'Affaires the decision that the French Government could not as far as it was concerned, give such authorization unless French troops should be authorized to occupy simultaneously Frankfort, Darmstadt, Hamburg, Hanau and Dieburg.

"On April 3 Dr. Göppert admitted that Reichswehr troops superior to the effectives fixed by the decision of August 9, 1919, had penetrated the Ruhr, and asked in the name of the German Government that the formal authorization necessary to that effect be given to the German Government after the act had been accomplished.

"The same day at Berlin Under-Secretary of State von Haniel informed General Barthelemy, who replaced General Nollet, that the German Gov-

ernment had given entire freedom of action to Commissioner Severing concerning the use of troops concentrated for the purpose of operation in the Ruhr Valley and assumed the responsibility for their action in the neutral zone.

"The French Government immediately informed its Allies of this communication, confirmed by its own information, calling attention to the fact that the German Government was violating Article 44 of the treaty—a violation constituting a *casus belli*—and expressing the hope that the Allied governments would recognize the necessity of immediate action and would lend assistance to France in an effective manner for the execution of military measures which could not be avoided or deferred.

"It was not the first time the French Government had warned its Allies of that necessity. As early as March 23 the French Government brought the proposition of occupying Frankfort and other cities before the council in London, which expressed the opinion on March 25 that the moment was not timely.

"The German Government addressed itself directly to the French Government to obtain authorization to send troops to the Ruhr Valley. The French Government had no reason to authorize such infraction of the treaty, inasmuch as its own information concurred with that of its Allies in deciding that the military occupation of the Ruhr was useless and dangerous.

"Facts demonstrate that the initiative in that operation must be attributed to the German Military Party. It was Kapp's government which took the initiative. It was the military party, which, despite the strong objections brought forward in the German Government itself against the projected intervention, affirmed the impossibility of reestablishing order without additional troops in the Ruhr.

"France was thus faced with a measure which, in the unanimous opinion of the Allies, could not be executed without previous authorization, which was not justified by the circumstances and which the German Government had taken a formal engagement toward France never to attempt without its authorization.

"The measure took an especially serious aspect owing to the fact that the Allies had been unable to obtain, despite their insistence, execution of the clauses of the treaty relative to German disarmament.

"The French Government thus acted in the general interest, as well as in the interest of France. It was necessary that it should take, in accordance with the Treaty of Versailles, a measure indispensable to its own security. There is no need to recall that it is resolved to evacuate the occupied cities as soon as the German troops have completely quit the Ruhr."

TREATY TERMS VIOLATED.—The text of the articles in the Versailles Treaty under authority of which the French have decided to occupy four German cities, follows:

"Article 42.—Germany is forbidden to maintain or construct any fortifications either on the left bank of the Rhine or on the right bank to the west of a line drawn 50 kilometers to the east of the Rhine.

"Article 43.—In the area defined above the maintenance and the assembly of armed forces, either permanently or temporarily, and military maneuvers of any kind, as well as the upkeep of all permanent works for mobilization, are in the same way forbidden.

"Article 44.—In case Germany violates in any manner whatever the provisions of Articles 42 and 43, she shall be regarded as committing a hostile act against the powers signatory of the present treaty and as well calculated to disturb the peace of the world."

GERMAN PROTEST.—Berlin, April 6.—The German Chargé d'Affaires in Paris was instructed to-day to hand to the French Government a note

protesting against the French occupation of Frankfort and other territory on the right bank of the Rhine.

The note, after referring to the contents of the French note of April 5, notifying Germany that the occupation had been ordered, asserts that the occupation of the towns mentioned in the French communication occurred before the note was presented to the German Government.

"We must in the name of justice, reason and humanity," the German note continues, "make the sharpest protest against the action of the French Army. It cannot possibly have been the intention of the Treaty of Versailles to prevent Germany from restoring order as quickly as possible in the part of its territory most seriously disturbed by bands of robbers.

"The movement in the Ruhr region, if it had not been quickly opposed, would have shaken the republic to its foundations both politically and economically. The German Government would have acted inexcusably if it had waited long, in the optimistic hope that the insurgent movement in the Ruhr district would end without military intervention, and events so far have shown that it was right.

"Everywhere that the troops arrived the movement quickly collapsed, and the fears expressed in the Allies that the very entry of the troops would make the disturbances worse and lead to the destruction of most important industrial works has, up to the present, not proved justified."

The note points out that alleged violations of the treaty must, under the terms of that instrument, be redressed by all the signatories on the Allied side, and not by a single one, acting independently.

ATTITUDE OF ALLIED POWERS.—The action of France was not fully supported by Great Britain or Italy. The British attitude appeared in a semi-official statement on April 8 as follows:

London, April 8.—After a long conference which the French Ambassador, Paul Cambon, had with Premier Lloyd George to-day, an authoritative statement was issued to the effect that France acted entirely on her own initiative in deciding to occupy German towns; that Great Britain, the United States, Italy and Belgium were all opposed to the plan, and that France's action has caused a delicate situation.

The statement proceeds:

"The German Government appears to have acted precipitately, and France to have responded by adopting a plan which was only intended as a last resort method, and even then to have been the affair of the Allies and not of any one of them simply."

Great Britain, Italy, Belgium and the United States declared that the duty of restoring order should be with Germany. All were opposed to the regular forces being called upon, except as a last resort, to undertake what are virtually police duties. It is pointed out that France feared some ulterior motive on the part of Germany, and doubtless acted in good faith, but, adds the statement, "the immediate result is that the responsibility for her action cannot be shared by the Allies as a whole, and certainly there is no intention on the part of the British Government to allow British soldiers to act as police between hostile German factions and incur all the odium of such a position, to say nothing of its risks."

The statement concludes:

"If, and when, France's suspicions of Germany's ulterior motives and deliberate flaunting of the terms of the Peace Treaty become accomplished facts, the Allies would doubtless be prepared to act instantly and vigorously in concert to vindicate the position and respect for the provisions of the treaty. But for the time being it may be taken that no British soldier will participate in the occupation of German cities in the neutral zone."

BELGIUM SUPPORTS FRANCE.—Brussels, April 8.—At a council of ministers held to-day under the Presidency of the King, the recent events in Ger-

many were examined into. In order to assert the principle of solidarity of the Allies before Germany and as a token of friendship to France it was decided to inform the French Government that the Belgium Government is ready to associate itself with France and to send a detachment in connection with the measures for the occupation of the Ruhr region.—*N. Y. Times*, April 9.

GERMANY

CONCESSIONS TO RADICALS AFTER KAPP REVOLT.—The Kapp rebellion ended ignominiously on March 17, when Dr. Kapp, General von Luttwitz and other reactionary leaders surrendered to the Bauer government and fled from Berlin. The restoration of the Bauer régime was accomplished by a general strike throughout Germany. As the price of their support, the government was forced to grant many concessions to labor, including the retirement of Gustav Noske as Minister of Defence, reconstruction of the cabinet on more purely socialist lines, socialization of all industries, including nationalization of the coal and potash trusts, and confiscation of all land not fully cultivated.

Foreign Minister Herrmann Müller accepted the post of Chancellor and formed a new cabinet, in which Adolf Köster on April 9 took Müller's former post in charge of foreign affairs.

GREAT BRITAIN

IRISH BILL PASSED SECOND READING.—On March 31 the New Irish Home Rule Bill passed its second reading in the House of Commons by a vote of 348 to 94. In the debate Premier Lloyd George stated that "De Valera is putting forth the same views that Jefferson Davis used," and added that such a movement had led to civil war. "We are doing nothing more than the United States claimed for themselves," he continued, "and will stand no less."

The bill provides for two parliaments, one of 52 members for northern Ireland, and one of 128 members for southern Ireland, with a council of Ireland consisting of a President appointed by the Crown and 20 members from each Parliament. The Irish Parliaments have control of all legislation except foreign affairs and foreign trade, coinage, and customs. The executive is the Lord Lieutenant, appointed by the Crown, who appoints his own Provincial Ministers. Ireland will be represented in the British Parliament by 30 members from southern Ireland and 12 from northern.

DENMARK

MINISTRY OVERTHROWN BY GENERAL STRIKE.—Following the plebiscite in the second Schleswig zone, which resulted in a large majority in favor of continued allegiance to Germany, a movement was begun by Danish conservatives to secure the zone in spite of the plebiscite, or at least to accomplish its internationalization. To this end King Christian dismissed the Zahle radical ministry. The Socialists and radicals at once instituted a counter movement, the Congress of Trades Unions resolving upon a general strike to begin April 6. Crowds in the public squares shouted for a republic. On April 5 the King was forced to give in to the popular

pressure, form a temporary neutral cabinet, promise election reforms, and proclaim an election for April 22. The events in Denmark, following the overthrow of the reactionary Kapp government in Germany by the same means, serve to illustrate the power of the general strike in politics to-day.

POLAND

POLAND'S TERMS TO RUSSIA.—The Polish peace terms to Soviet Russia, as published on March 26, called upon Russia for indemnities, guarantees against propaganda, return of all art treasures, etc., taken from Poland, and surrender or self-determination of all territory up to the old boundaries of 1772. This territory, much of which is at present occupied by Polish troops, would extend the Polish boundaries to the River Dneiper, beyond those assigned Poland by the Peace Treaty.

On April 2 the Poles refused a Soviet proposal for an armistice on the entire battle front and a peace conference in Esthonia.

TURKEY

ALLIES OCCUPY CONSTANTINOPLE.—On March 16 Allied forces under General Milne of the British Army occupied Constantinople without opposition, under protection of a strong fleet in the Bosphorus. A proclamation was issued stating that it was the purpose of the Allies that the Sultan should retain Constantinople. A change of cabinet was brought about, owing to the refusal of the Grand Vizier Sali Pasha to declare the Nationalists in Asia Minor revolutionary and in insurrection.

PRESIDENT WILSON ADVISES EXPULSION OF TURKS.—Washington, March 30.—Expulsion of the Turkish Government from Constantinople and Europe is advocated by the United States in the note made public to-day, wherein President Wilson replied to the request of the French Government for the views of the United States on the tentative decisions, reached by the Allied Powers in regard to the Turkish settlement.

One of the British arguments in favor of the retention of the Sultan in Constantinople has been that his expulsion might stir the Mohammedan world to revolt. The United States takes the position that there is no real ground for fearing a holy war, and that the arguments against permitting the Sultan to remain in Constantinople are much stronger than those for his retention.

The American note commends the decision of the Allies eventually to accord Russia representation on the international council proposed for the government of Constantinople and the straits.

It suggests, as a method of determining the future of Mesopotamia, Arabia, Palestine, Syria and the former Turkish islands, that Turkey place those territories in the hands of the great powers, to be disposed of as these powers determine.

A solution of the Armenian question which will give the new state "easy and unincumbered access to the sea" is recommended, and the hope is expressed that such access to the Black Sea will be accorded by the granting of Trebizond to Armenia.—*N. Y. Times*, March 31.

FEISAL ASSUMES SYRIAN CROWN.—Emir Feisal, son of the King of Hedjaz, proclaimed himself in March King of Syria, thus disarranging Allied plans for the disposition of Turkish territory in the Levant, where

the French planned to assume a protectorate. The Emir sent one of his generals to Paris to defend his action.

LEAGUE CONSIDERS MANDATE FOR ARMENIA.—Paris, April 9.—The executive council of the League of Nations met here to-day for discussion of the mandate for Armenia; the protection of minority nationalities in Turkey; the municipal elections to be held in Danzig and the repatriation of the prisoners of war in Siberia.

JAPAN

JAPANESE OCCUPY VLADIVOSTOK.—On April 5 Japanese troops carried out a surprise occupation of the port of Vladivostok, under shell fire from Japanese ships. The move resulted from efforts of the Red government in the city, by boycott and otherwise, to force Japanese evacuation.

In a notice to the U. S. State Department on April 3, Japan declared that the protection of Japanese interests demanded the temporary retention of her forces in eastern Siberia, but affirmed that the troops would be withdrawn as soon as these conditions were overcome. The last of the American troops left Vladivostok on April 1.

JAPAN DENIES FORTIFYING PACIFIC ISLANDS.—Washington, April 5.—Japan has not fortified any of the former German islands in the Pacific and has no intention of doing so, Ambassador Shidehara said to-day in a statement commenting on reports recently published both in this country and Europe.

Mr. Shidehara said that Japan was adhering strictly to the terms of the Peace Treaty, and that under the League of Nations covenant it not only could not fortify the islands, but could not even train the natives for military purposes beyond police work.—*N. Y. Times*, April 6.

LATIN AMERICA

MEXICO RESUMES INTEREST PAYMENTS.—On March 28 it was announced that Mexico would resume interest payments on its foreign debt of about $100,000,000, a third of which is held in the United States.

BOLIVIA INSISTS ON SEA OUTLET.—Buenos Aires, April 9.—Bolivia will continue to pursue with "irrevocable resolution" its purpose to obtain the port of Arica as an outlet for her to the Pacific, according to a new note from Bolivia to Peru, which is published here.

The note answers the latest Peruvian communication declining to recognize Bolivia's aspirations.

WANTS ARBITRAL COURT WITH UNITED STATES OUT.—The Congress of Salvador has adopted a decree proposing the creation of a Latin-American court of arbitration with the United States excluded. This proposal has been communicated to other Central and South American republics and also to the U. S. State Department.

REVIEW OF BOOKS
ON
SUBJECTS OF PROFESSIONAL INTEREST

"Mess Management." By Lieut. Colonel William E. Dunn, U. S. Army. 106 pages. (Philadelphia: Published by the J. B. Lippincott Company.)

Mess management too frequently is mismanagement. The really successfully managed messes in army, navy or marine corps can be counted on the fingers of one hand. Any information on the methods of subsisting men in large groups, or on the manner of accounting for issues of stores with the means to arrive at a correct balance at the end of every working day, should be exceedingly welcome to any person engaged in this work.

Not only has the author of "Mess Management" devised a simple scheme of computing costs, but he has devoted 50 and more pages to a tabulation of menus with the weights of all stores used in preparing the meals.

While the text of the book has particular application to messes of the army, rationed under a different system from that used in the navy and marine corps, a little ingenuity on the part of anyone interested could adapt most of the suggestions to the navy ration.

The book is recommended to all officers, petty officers, and non-commissioned officers who are plagued with the duty of arranging menus and devising meals for the usual enlisted men's mess and who are not averse to accepting some mighty good dope on the number of pounds of the various things it taks to feed 100 men, more or less, three good meals a day.

J. M.

"Recruit Manual." By Colonel George C. Thorpe, U. S. Marine Corps. 168 pages. (Philadelphia: Published by the J. B. Lippincott Company.)

A small manual with satisfactory explanations of all the important things a recruit should know. While the preface seems to indicate that the book is intended for any recruit, it has been prepared chiefly for recruits of the marine corps and it is to these young men that the volume will be particularly valuable.

Officers and non-commissioned officers on duty at recruit depots will find their not always unruffled course considerably smoothed if this manual can be placed in the hands of every newly arrived recruit.

The section devoted to the explanation of military and naval law in its particular application to enlisted men should go a long way toward reducing the number of "sea-lawyers" in the marine corps.

The manual would be improved by a brief index and a few illustrations in the sections on signals, the manual of arms and squad and company drills. The inclusion of illustrations would merely be an extension of the plan of "visual" instruction, upon which Colonel Thorpe, with adequate reasons, lays so much stress.

J. M.

"The Air Propeller." By Frederick Bedell, Ph. D., Professor of Physics, Cornell University. Price $1.00 net. (New York: Published by D. Van Nostrand Company.)

This is a pamphlet of some 90 pages, including about 20 pages of diagrams and sketches, intended to give in simple words a practical working knowledge of propeller characteristics, a general knowledge of its theory, and to serve as an introduction to a more detailed study of the propeller, practically or theoretically.

The author first discusses the characteristics of airplane engines that bear on power available for flight, and then proceeds to treat the air propeller, its operation, characteristics, and theory as a rotating areofoil.

The explanation of terms used in connection with propeller operation, and characteristics, and the discussion of the areofoil theory for propellers, are clear and concise, and the subject is well handled.

As an elementary text-book, or for general reading by those interested in aerodynamics, the pamphlet should prove of considerable value.

W. G. D.

"The Dover Patrol, 1915-17." By Admiral Sir Reginald Bacon. (George H. Doran Company.)

From the day early in 1915 when Admiral Bacon took over the command at Dover from Rear Admiral Horace Hood, afterwards lost while leading his battle-cruiser division at Jutland, until late in 1917 when he was himself superseded by Sir Roger Keyes, Admiral Bacon was engaged in what was perhaps the most interesting and stimulating work that fell to the lot of any British flag officer during the entire war.

The Dover Patrol had surveillance of that strategic area between the North Sea and the English Channel, veritably the neck of a bottle through which the vast and vital tonnage of Allied shipping must be kept flowing uninterruptedly and from which the raider and the submarine must be excluded. Across the channel moved a steady stream of transports. During Admiral Bacon's tenure in office, 120,000 merchantmen were passed through and 5,600,000 troops were carried across without accident to a single man.

The varied activities of the command included besides the management and convoy of this enormous traffic, constant patrol, bombardments of the enemy's positions, laying of mine barrages, landing and transporting heavy ordnance in Flanders, preparations for the descents on Zeebrugge and Ostend, and many other urgent demands.

Naturally one would expect to find the very best matériel assigned to the Dover Patrol.

Far from it. The bulk of the work was of a defensive character in this water area of 4000 square miles and destroyers were the chief factors of this defense. These were sadly lacking in numbers, for rarely more than nine were available and all were of the older types. On a certain occasion there was but one, and dummy radio signals were made to those absent to make the enemy believe that there were destroyers in the Straits. Units of the force were at all times disposed so as to deny knowledge of their

scarcity. Trawler and drifters, as everywhere else, performed yeoman service. Certainly Great Britain properly takes pride in the war work of her fisher folk and the drifter "skippers." At Dover they were the main reliance.

Admiral Bacon realized that the needs of the Grand Fleet were paramount and that the Admiralty had full knowledge of the "whole requirements of the navy." He says it was his "business to do the best I could with such forces as I had and not grumble." It was impossible to explain to the British public the inadequacy of the defense of the Straits "since that piece of information would have been invaluable to the enemy."

In this theater of war Germany had the initiative. She failed to use it. At other times and in other places, also, was this too apparent. It can be explained in the light of subsequent events that the German Navy had no sea instincts. In Admiral Bacon's words, "Naval operations are to a great degree governed by instinct, and instinct is a matter of heredity." No naval traditions, English sailors said when they beheld that pitiful surrender in the Forth. Nothing to fight for, the Americans put it.

Many times all of us would have liked to change places with the enemy and play the game over again.

It was a great game and the way it was played at Dover is most readable. The accounts of the operations on the Belgian coast, the work with the French, the air patrol, the barrages in the channel, the "incomparable" Sixth Flotilla—all of these are stirring experiences which will live as long as there are tales to tell of land and sky and sea.

W. T. C.

"Internal Combustion Engines." By Wallace L. Lind, Lieut. Commander, U. S. Navy; M. S., Columbia University. 218 pages. Price, $2.20. (Published by Ginn & Co.)

The purpose of the author as expressed in the preface, "to provide a practical and up-to-date text on internal combustion engines" has been accomplished very successfully.

Briefly relating the history of the subject in the opening chapter, the book goes on to treat in a clear and concise manner the elementary considerations which have led to the development of this common type of power plant, its principal parts, the thermodynamic considerations which are important to its being completely understood and a comparison of the different fundamental types of engines.

Later chapters deal in detail with the engine and appurtanances, carburetion, ignition, lubrication and cooling systems.

The three adaptations of the engine, for automobile, aeroplane and marine use are given separate consideration, and examples of each type are discussed.

Three principal features of the book especially commend it: the Trouble Chart which is invaluable to an operating engineer, the excellence of the diagrams and illustrations, and the unusual clarity of the presentation.

F. V. V.